

COMPUTERWORLD

F O C U S

Relief from the backlog crisis

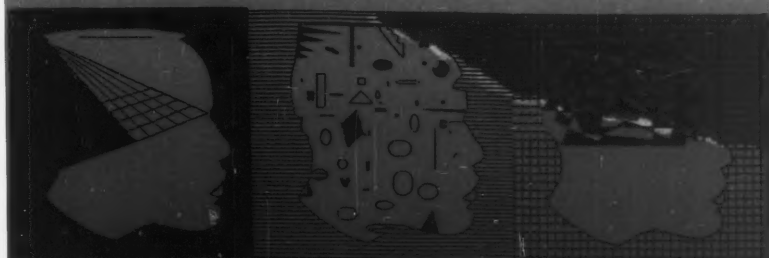
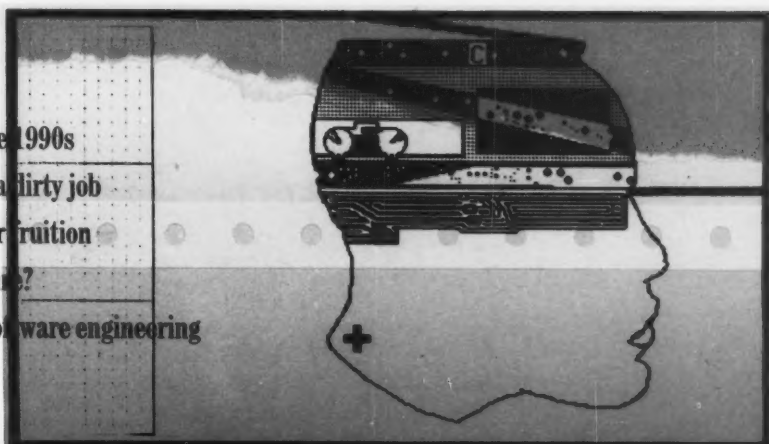
Management in the 1990s

Maintenance: It's a dirty job

CASE systems near fruition

OS/2: Is it the future?

Special Section: Software engineering



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Software productivity

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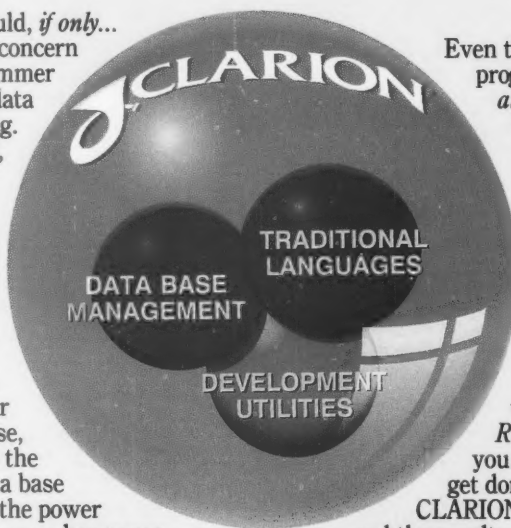
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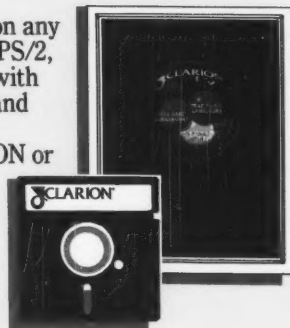
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in focus

DIRECTING TALENT

At the heart of many system implementation failures lies a gap between people and technology. Nurturing a skilled, talented staff is an art that can be learned. Failing to deal with human resource issues can damage organizations immeasurably and lead to less than successful systems performance. By Roger Sobkowiak. Page 16.

IS OS/2 THE FUTURE?

OS/2 and PS/2 may force MIS to rethink the direction that computing will take in their companies during the next 20 years. Many consider these offerings to be IBM's most attractive products in a long time; others consider them to be a Pandora's box that, once open, will overrun a firm with a software overhead of cataclysmic proportions. By Brian Jeffery. Page 25.

MANAGEMENT IN THE 1990S

MIT has undertaken an ambitious five-year program to study the effect that the rapid acceptance of computers has had on companies and workers. Leaders of the individual projects that make up the program discuss what the future holds for information systems and MIS professionals. By Stan Kolodziej. Page 45.

CASE systems near fruition

By Rebecca Hurst. CASE is said to offer salvation from hand coding and applications backlogs. Read about the CASE products available to fit your needs. Page 27.

UIMS

By Stan Kolodziej. User interface management systems pack a productivity punch but have remained an industry secret. Find out about these mysterious tools. Page 31.

Computers R Us

By Sandy Austin. A number of Fortune 500-class firms are getting into the software business. See how they're faring. Page 39.

Maintenance is a dirty job

By Girish Parikh. Software maintenance won't go away. Learn how to turn this unpopular job into a cost-cutting, productive one. Page 47.

Users debate 4GL virtues

By Rebecca Hurst. Users state the pros and cons of using a 4GL over a third-generation tool. Page 49.

Compiling facts on toolboxes

By Walter Kozachek. Toolboxes help free you from the tedious chore of coding. Here's some advice to help you shop for one. Page 51.

Humanizing the machine

By Larry R. Harris. See what is taking AI out of the labs and into the commercial mainstream. Page 55.

SPECIAL SECTION



Software engineering

MIS managers have long felt that there was little software engineering could offer commercial, real-world programming. But as pressure increases on them to speed up software development and maintenance, MIS will need the productivity benefits that software engineering techniques and tools, such as CASE, provide. Begins on page 35.

From the Editor

Including your letters to us. Page 5.

Q and A

Amoco data base administrator's thoughts on IBM's maturing DB2. Page 6.

Manager's Corner

Jim Young on methods analysis. Page 8.

News & Analysis

PS/2 news; X Windows; R&D consortia; high-tech help for the blind; Cadre's EDIF support. Page 9.

Products

Tech Talk on CM2; C tool that cracks 640K limit; Hot Seat column; product checklist. Page 57.

Blue Beat

Deidre Depke on the realities of OS/2. Page 57.

Calendar

Industry events. Page 60.

The Insider

Thomas Roberts on the fluff in integrated office systems. Page 64.

Log Off

The lowdown on Unix use in the technical and commercial arenas. Page 64.

COVER ILLUSTRATION BY ISTVAN BANYAI

Digital
has
it
now.



"It's access – fuller, easier information access that's at the heart of our success in selling Digital's networked desk-top computing," states Tom Curry, vice president of Marketing at McDonnell Douglas Manufacturing and Engineering Systems Company. "Architectural engineers now realize that the isolated PC is not the answer."

In Mr. Curry's view, Digital's ability to network, plus compatibility from individual workstations to huge processors are ideal for the architectural community. "For any building project to progress smoothly, there has to be a coordinated effort. The group working on lighting, for example, needs to share information



"With Digital's networked desk, McDonnell Douglas is giving architectural engineers a more productive way to build."

with those designing heating and ventilation. In the Digital environment, that's exactly what they do."

"In our own marketing efforts," adds Mr. Curry, "Digital offers two enormous competitive advantages. Planning for the future is easier because of Digital's commitment to compatibility. And we do very little selling of Digital to our customers – engineers are already sold." To get your competitive advantage now, write:

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digital™

Watch what happens next time you ask a mainframe software vendor for a complete customer list.



You may get a convincing song and dance, but underneath it's a different story. Behind those pat answers that software vendor is actually sweating and squirming.

Why don't they want you to see a complete list? Simple. They know that their size and name familiarity do not guarantee happiness. Many "single source" or "all-things-to-all-people" vendors have, at best, uneven quality across a multi-application product line. They know that their customer list may contain a good number of less-than-happy clients. It's difficult for these vendors to commit the human and monetary resources necessary to produce the type of superior product available from a firm that specializes in a single application area. A firm like Data Design.

Data Design develops mainframe financial applications software. Period. We understand all our users' requirements and are therefore able to provide the necessary support: over 40 percent of our support and installation staff are CPAs or have MBAs.

Data Design doesn't balk at giving prospective

customers a *complete* customer list. That's because hundreds of FORTUNE 1000 companies have reaped exceptional results from our financial software systems. Alcoa, Gerber, Pillsbury, Sherwin-Williams, Merrill Lynch, Bankers' Trust, Bristol-Myers, Federal Express, Litton, Lloyd's Bank, The New York Times Company, Owens-Corning, Royal Business Machines, Warner-Lambert and hundreds more have opted for Data Design over other major vendors. Write for our complete customer list and ask *anyone* on it about our fast, trouble-free implementation; system flexibility and ease of use; in-depth training and responsive, knowledgeable support; *management level* people in customer service positions, and more.

You'll find that people who want financial software relief choose Data Design. Since 1973, nationally recognized independent software surveys have confirmed Data Design's unsurpassed record of user satisfaction—year after year. That's why we'll give you a complete customer list—and *they* won't.

So, if you're in the process of looking at main-

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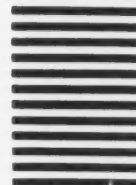
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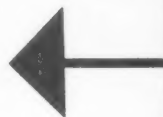
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We welcome letters to the editor and publish those we judge to be of interest to our readers. Letters should be addressed to the Editor, Computerworld Focus, 375 Cochituate Rd., Box 9171, Framingham, MA 01701-9171.

FROM THE EDITOR

100% over budget

MIS is facing a continuing software crisis that threatens to delay any potential productivity gains expected from computer use. An applications backlog has been with us for years, and as computing spreads, user demand for better and more varied applications escalates. The average wait for unwritten or unimplemented software is estimated to be between five and seven years. Meanwhile, the average software project is often one year behind plan and 100% over budget. What's more, firms can spend 50% of their computer budgets on software and still not achieve high-quality results or reduce their backlogs.

All hope is not lost, however. Tools are being developed to aid in the fight for greater productivity. MIS should not ignore nontraditional techniques and technologies for fear of lessening its power. MIS needs to shed its traditional, static role of implementor and don the guises of problem solver and business planner. The process will not be an easy one. Not only will MIS have to experiment with different technologies, but it will also have to try different organizational procedures. Utilizing people as a resource is essential to any project and is an aspect that is often overlooked. It is important to develop a clear picture of what can be accomplished with software advances and what cannot. Scrutinize the trade-offs but don't delay — the search for a productivity tool solution may only add to your problems.

MERGER MANIA STRIKES CLOSE TO HOME. Another important event in the industry that impacts MIS and users is the increase in acquisitions and mergers among software vendors. A case in point is Computer Associates International, Inc.'s recent surprise acquisition of Uccel Corp. On one hand, the consolidated company may have increased funds for R&D, product promotion and service. Furthermore, larger firms can usually be counted on to be around for the long term. On the other hand, customers are often not given the personal attention they may have received when their vendor was small and struggling. Additionally, a more competitive market offers customers more choices at better prices. If the trend toward acquisitions continues, the very nature of the competitive independent software industry may change substantially.

Ann Dooley

Access Technology program runs on IBM machines

I read with interest the Special Section on IBM's 9370 written by Michael Tucker [*Computerworld Focus*, May 6] and found it to be thorough and insightful.

I would, however, like to make one correction in reference to Access Technology, Inc. The author reported in the Special Section article that Access Technology does not currently run on IBM machines.

In fact, we have had an IBM VM/CMS version and an IBM Personal Computer version of our 20/20 spreadsheet available to our customers since October 1984.

In a study recently undertaken by Sentry Publishing Co., Access Technology was found to be a leading vendor of mainframe spreadsheets, with close to 10% of the installed user base in 1986.

Access Technology looks forward to continued success in the IBM marketplace, and we feel that the IBM 9370 machine will play an important role in that success.

Carl Nelson
Vice-President, Marketing
Access Technology, Inc.
South Natick, Mass.

Compliments on Focus's redesigned look

I just wanted to tell you how nice *Computerworld Focus's* new format looks. The color looks great. Congratulations!

Tracy Haller
Kalman Communications
Santa Monica, Calif.

The importance of a resume that reads 'experienced'

I am responding to a letter written by Ken Yeager of Futures Personnel Services, Inc. entitled "Don't Leave Your Future To Others" [*Computerworld Focus*, March 4].

Yeager mentions that not enough large institutions and colleges offer co-op programs that give the students of today the hands-on experience they need.

I am currently enrolled in a computer technician course at the Baton Rouge School of Computers in Louisiana, and I find it very interesting and challenging.

I have kept in touch with a few graduates who are now out in the real world trying to find a lucrative job.

Although I find the Baton Rouge School of Computers to be a fine institution, many graduates are still looking for employment because their resumes do not read "experienced."

I feel optimistic about securing employment after I receive my graduation certificate from school, but I am sure that it would be more helpful in hunting for a job if my resume included practical experience.

I agree with Yeager that there should be more co-op programs available to students to give them the hands-on experience companies are looking for!

M. Oberding
Baton Rouge, La.

VIEWPOINT

Q AND A

Howard Fosdick

DBMS double take: Amoco data base chief says maturing DB2 deserves a second look

Howard Fosdick is the president of the Midwest DB2 User's Group, headquartered in Chicago. The Midwest users group was formed more than two years ago when it became obvious that DB2 had become IBM's primary relational data base management system offering.

As data base administrator for Chicago-based Amoco Corp., Fosdick is also one of the first users of IBM's DB2. Fosdick recently spoke with *Computerworld Focus* Senior Writer Rebecca Hurst about the reasons behind using DB2 and the young DBMS's technical problems and solutions.

Why did you first decide to use DB2?

Amoco has a group that does nothing but evaluate products. Three years ago, the group be-



gan to work with DB2 to see if it met our requirements. The group reported that DB2 wasn't mature enough to do much of what we wanted. There was no question, though, of whether we were going to buy DB2; we just had to decide when. As it was, we went fairly early.

I can't speak for all companies, but at Amoco, we saw some advantages in going into DB2 early. Even if the product was not strategic then, we knew it would be later. Also, it takes awhile to develop experience with a DBMS, and IBM gave us a lot of special help.

From your perspective, how seriously is IBM marketing DB2 and IMS together?

The official story for some time has been that IBM is taking a dual-DBMS strategy. In reality,

I think IBM has sold all the copies of IMS it's going to sell. IBM is pushing DB2 very heavily.

If that is the case, will DB2 completely replace IBM's IMS?

A small company with one mainframe may well replace IMS with DB2. A company like Amoco has hundreds of systems running IMS, therefore, moving them all to DB2 would be cost-prohibitive. We have five mainframes at this site alone. We'll use DB2 as we develop products. With so much invested software, though, we'll probably have IMS for many years to come.

What technical concerns have you had about DB2?

Performance has been one concern. There has been a bit of a trade-off in using DB2 instead of IMS. DB2 automates a lot more tasks for programmers. Using IMS, we might need three or four programmers, while we only need two using DB2. Users pay a price in performance, though. You have to weigh the cost of the systems analysts' time vs. the cost of slower performance.

Release 1 of DB2 was not a good performer at all. IBM has

been responsive, though, and Release 2 is much better. Release 3 will come out in another month or so, and it [is expected to] perform better, so performance [may] no longer be the issue it once was.

Basically, DB2 running on IBM's MVS operating system suits our needs very well. In the future, though, we may have a problem if we need to run DB2 on more than one computer. DB2 is a single-computer system, so we would have to put a copy of DB2 on every machine. I hear that IBM is working toward distributed data processing so that [scenario] should not be a problem.

How well does DB2 compare with other data base management systems? Would you consider purchasing one of these non-IBM products?

If you compare the fourth-generation language capabilities of DB2 to other DBMS, it's pretty weak. DB2 has a good kernel, but there are a lot of little missing parts because the DBMS is new. However, we're so heavily invested in IBM that we try to go with its products as much as possible. Where we need added capabilities, we buy add-on prod-

ucts from third-party vendors.

Other factors [in going with IBM] are IBM's strength in the market and the number of DB2 users. DB2 is so big that there are a lot of third-party vendors that supply product enhancements. Every DBMS has strengths and weaknesses, but if you go with a smaller vendor's product, you're stuck with it. There's [usually] no one else supplying add-on products.

What types of add-on products are users buying for DB2?

Members of the Midwest User's Group are looking at applications generators such as the one from [Palo Alto, Calif.-based] Sage Software. There are a number of products that handle full screen insertion of data, an area in which DB2 is weak. Users are also buying tools that help move applications from a test environment to a production system.

How viable is DB2 as a DBMS?

A lot of things in DB2 don't work, but it is evolving in a hurry. I've seen major improvements in the past two years, and I'd advise anyone who wasn't happy with DB2 a year ago to look again.

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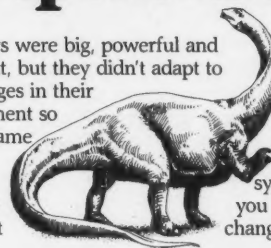
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MANAGER'S
CORNERMethods analysis
revisited

Jim Young

By and large, I am not a believer in the good old days. I prefer data processing as it exists today. However, occasionally I come across a practice that fits today's needs and, therefore, deserves a revival. The technique of methods analysis is such an area.

Methods analysis was a holistic approach used by computer professionals that included designing the entire work process along with the computer system. Methods analysis took many of its tools from old time-and-motion study methods as it attempted to engineer the workplace. As a result, not only did a company create a system, but it also formed all adjacent elements, including work structures, job content, forms design, paper



Young is managing director of MIS for the Wheeler Group, a division of Pitney Bowes in Hartford, Conn.

flow and so on.

I have a number of theories about why this approach went out of fashion. First, methods analysis is a precise, overbearing process and quite threatening. It conjures up the image of a silent observer with a clipboard unilaterally changing jobs. Moreover, this technique is consciously complex, requiring extensive data collection and bureaucratic overhead. In many instances, MIS chose to abandon this technique in the spirit of improving project productivity and user relations.

There are other reasonable causes for the demise of methods analysis. Many applications, though, needing an initial work structure, have since seen a basic process and work pattern become established. There is no reason to cause the upheaval brought on by a major reassessment.

These processes also have a diminishing amount of manual and administrative

content, which lessens the benefits of methods analysis. In the meantime, to reduce costs, management has tended to take proposed comprehensive studies and whittle them back to less ambitious and less thorough efforts. As a result, any changes to these systems tend to be evolutionary rather than revolutionary and inappropriate for a fundamental design methodology.

Another deciding factor for avoiding methods analysis is the changing balance of authority over applications. No longer are users the passive recipients of MIS's services. Today, they are active participants in design activities and often make their business analysts responsible for how users interface with DP technology. With the increase in personal computer use directly within applications, users are increasingly exercising responsibility for some of the technical portions of their applications. They don't feel they need MIS techniques to tell them how they should conduct their work.

As a result of the trend toward greater user leadership, evolving system changes and shrinking manual content, data processing has been misdirected to a limited and less effective posture. Because of a diminished opportunity to use the global approach of methods analysis, not many in MIS are learning its skills, and all but the most resistant of practitioners are becoming atrophied in this area. Unfortunately, this situation means that the scope of projects has not been as broad as it should be. MIS has responded to and perhaps fostered the attitude that technology is the answer. The systems MIS does design frequently stop at the hardware. Not only do we fail to always look at the situation in broad terms, but we also fail to consider simple, nontechnical alternatives in our designs.

Why does it make sense to revert to an old technique like methods analysis? With some changes, methods analysis can optimize the effectiveness of data processing and help improve the state of today's applications.

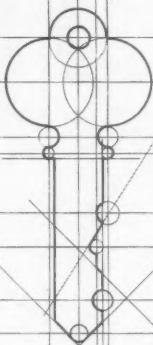
The systems that have been evolving have not had the benefit of a redesign and consequently carry old inefficiencies around. For example, most systems rely heavily on standardized reports and do not take advantage of the flexibility of decision support systems. Today, productivity tools make methods analysis much more attractive. If MIS redesigned systems, it could implement these systems using new productivity tools, thus enabling them to be modified. Use of such tools would free up a greater amount of project time compared with traditional development technologies. The extra time could reduce project costs and minimize overall time to completion.

Efficient interfaces

The growth of integrated systems is another justification for methods analysis. Even in environments in which users successfully design their own systems, tools are needed for MIS to ensure that efficient interfaces exist across functional boundaries.

The major reason for a methods analysis approach is the increasingly urgent need to examine the big picture. Different industries are desperate for a last measure of productivity improvement. Ultimately, productivity improvements will only come through fundamental reassessment of what jobs should be done and how they should be performed. As companies identify strategic systems opportunities, making sure they perform as intended may require MIS to examine the building blocks of the workplace. As we competitively strive for increases in productivity, methods analysis is a tool to use to increase thoroughness.

Regardless of how it is approached, the return to a more comprehensive design technique is imperative. Rather than reinventing the wheel, we can revive a successful approach from our past. With a little modernization, it may come to the rescue of our beleaguered applications development efforts — and not a moment too soon.

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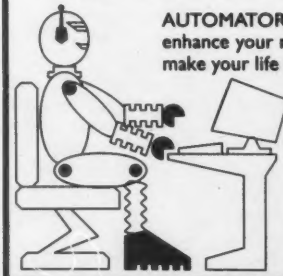
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news & analysis

UPDATE

Lotus pens pact with IBM

Lotus Development Corp. has stormed back into the headlines again. The Cambridge, Mass.-based software company celebrated its fifth year of existence by penning a 10-year joint marketing and development agreement with IBM. First on the list of IBM/Lotus ventures will be an IBM mainframe version of Lotus's 1-2-3, which is scheduled to appear early in 1988. Lotus also announced that the pact will result in a low-end data base management system for personal computers.

Both products will use IBM's Systems Application Architecture, giving Lotus the ability to plug both products into OS/2, IBM's Personal System/2 operating system, and IBM's 370-based mainframe architecture. Analysts are saying the deal will help Lotus make out like a bandit, giving the company a huge edge in selling into the IBM mainframe marketplace as well as a big push in developing a relational DBMS for the high-end IBM PC market.

In response, Digital Equipment Corp. has kicked up some of its own spreadsheet dust. The company has announced Version 3.0 for both its VAX Decal and VAX Decal-Plus spreadsheet programs. The versions, DEC claims, will provide much larger spreadsheets than previous editions.

Microsoft strikes DBMS agreement with Sybase

Microsoft Corp. and Sybase, Inc. have entered into a licensing agreement allowing Microsoft to use Sybase's relational data base management system as a back or front end to Microsoft MS-DOS. It seems as though Microsoft, pressed to produce a relational DBMS, has had to purchase the data base technology from another firm to do it.

SAPC hits Lotus with Visicalc 'look and feel' suit

Not all is gravy in Lotusland. Lotus Development Corp.'s push to secure copyright protection for the "look and feel" of its packages recently suffered a setback.

The company was slapped

with copyright infringement and misappropriating trade secrets by SAPC, Inc., a firm made up of former Software Arts, Inc. executives and producers of Visicalc, which is claimed to be the original personal computer spreadsheet package. Ironically, SAPC principals claim Lotus's 1-2-3 comes too close to copying the structure and sequences as well as the total "look and feel" of the Visicalc program.

ADR claims IBM hurting third-party developers

IBM is not without its problems. Right after the company announced that its DB2 relational data base management system would be the first application under its Systems Application Architecture, top officials at Applied Data Research, Inc. (ADR), a Princeton, N.J., software developer, claimed that the move could hurt third-party software developers.

ADR said it feels that because IBM's proposed Extended Edition OS/2 operating system will have a relational DBMS and communications manager built into the operating system, third-party software developers such as ADR are being preempted from a potentially lucrative market.

ADR means business. It has taken the issue to ADAPSO with the intent of passing it on to the U.S. Department of Justice and the Federal Trade Commission.

IBM has remained silent.

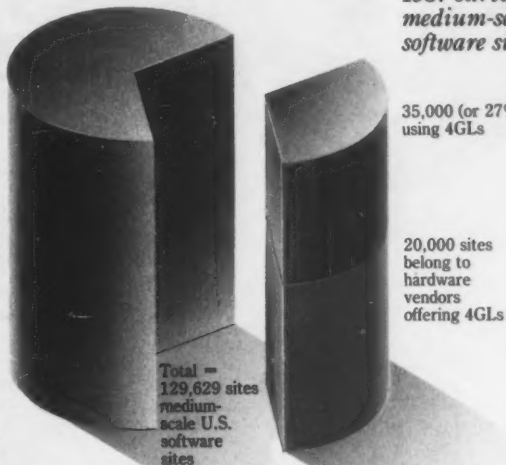
D&B unveils PC version of Nomad2 language

Fourth-generation languages enter the personal computer world. Wilton, Conn.-based D&B Computing Services, Inc. has come out with a PC version of Nomad2, its mainframe fourth-generation language. D&B claims the PC version carries most of the attributes of mainframe Nomad2, including windowing techniques that help users access mainframe data or develop their own applications.

D&B also claims that PC Nomad is a relational product that can create IBM SQL queries from its syntax and store data in its own relational data base

Continued on page 12

4GL flurry 1987 survey of U.S. medium-scale software sites



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CHART BY BRUCE SANDERS

PS/2 debut fanfare fails to appease concerns

It was quite a party. Everyone attending April's IBM Personal System/2 announcement says nothing like it had been seen since IBM introduced the 360 back in the 1960s.

"I was at IBM's Personal Computer AT and Topview announcements, and they weren't even close," claims John Parsons, president of Micro-Integration Corp., a Friendsville, Md., developer of bisynchronous communications packages for IBM PCs. "This announcement was well orchestrated."

It must have been. Some attendees from research group International Data Corp. (IDC) in Framingham, Mass., say they saw 20,000-odd participants brought together by IBM through a live broadcast over IBM's internal television network. With all the spotlights, music videos and general ostentation, the IDC staff members say the entire production gave off a whiff of TV evangelism.

Not all guests were in a spirited mood, however. Parsons claims that the demeanor of attending IBM PC board and clone manufacturers quickly changed from excited to ugly when a technical seminar switched from a two-hour briefing into a brief

shouting match after it became apparent that IBM would release no technical details of the PS/2's Micro Channel bus until this fall.

Parsons, speaking as an independent software vendor, says the IBM announcement revealed to him just how much work IBM had to do to improve its relations with the independents.

"One of the most surprising things was the fact that IBM wasn't prepared to make sure independent software vendors were able to purchase machines after the announcement," Parsons claims. "IBM's a little slack on the hardware side, but it does offer the independents good discounts on new PC software."

There were other mysteries. The PS/2 Micro Channel bus will offer concurrent communications and come in both 16-bit and 32-bit flavors. What Big Blue has not made clear, however, is whether the machine's bus can be cloned legally.

That mystery could spell trouble.

"IBM's OS/2 operating system is offering open-ended software not very different from

Tools for the visually impaired user in a sight-dependent industry, page 13.

Continued on page 11



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Fanfare

Continued from page 9

existing operating systems from Microsoft Corp.," Parsons says. "I can't see software developers having any problems working with the new machines," Parsons claims.

"Hardware vendors, however, are going to have some problems. The entire inside of the new IBM machines consists of little tin cans that snap together like Lego blocks. About 80% of the PS/2 Models are made up of proprietary IBM components," he explains.

PC rules have changed

As a result, according to Parsons, the IBM PS/2 announcements have succeeded in changing the rules of the personal computer game.

"It's going to be much more expensive for clone makers to duplicate the machines," he claims.

"The disk drive for the PS/2 uses different engineering than other drives, and the motherboard is 30% smaller. The days of cloning in a garage are gone," Parsons claims.

Taking their sweet time

Thomas Roberts, manager of personal computer research at IDC, says that users will take their sweet time migrating to the OS/2 operating system.

"Users are tentative and suspicious of OS/2 right now," Roberts says. "There are huge investments in Microsoft's existing MS-DOS, and there are no real performance advantages running existing applications under OS/2."

"There is also a popular misconception that OS/2 is a true [Intel Corp.] 80386 operating system and that it can make existing applications run in multitasking mode. That's not the case," he says.

Inconvenience vs. new software

Roberts adds that the inconvenience of migration to OS/2 must be balanced by compelling new software applications. Such applications probably will not arrive, however, until at least the last half of 1988, right in the middle of what Roberts calls "the period of missionary selling for OS/2."

Could the PS/2 announcement have been premature? The lack of details on the bus and skimpy technical documentation point to IBM scrambling at the last minute to get the announcement off the ground.

"Another clue was the amazingly similar answers that all of the IBM employees gave to questions," one announcement attendee explains. "It was as though the IBM people were put together at the last minute and were versed in every possible question. It seemed like they had little cue cards glued to the insides of their glasses." —SK

dB

By Rich Tennant



X Windows gets IBM, Sun support; seen as victor in standards race

The Unix world, generally quick to embrace industry standards, has shown signs of internal conflict over graphics windowing definitions. The battle has subsided, though, and the X Windows system appears to be the victor.

X Windows, graphics and windowing software developed at MIT as part of the university's Athena project, provides a common interface for applications developers, says Bruce Huie, a senior analyst at Framingham, Mass.-based International Data Corp.

"Applications developed for X Windows can be easily ported from one machine to another," Huie says. Like the Apple Computer, Inc. Macintosh interface, X Windows will also provide users with a common platform for using different Unix applications.

"The potential storm that was brewing quickly dissipated in April when Sun announced that it would integrate Version 11 of the X Windows, known as X.11, with NEWS.

Sun promoted NEWS because it is a richer program than X Windows, according to Huie. However, Sun and other vendors will incorporate their more sophisticated functions on top of NEWS, he says. "X Windows serves as a baseline standard for vendors. It's the enhancements that differentiate their products," Huie explains.

Similarly, any Unix-based graphics windowing package announced for the Apple Macintosh II will contain the X.11 standard.

Connectivity with Digital

Equipment Corp. has become an important business strategy for Apple, Huie explains. Therefore, because DEC has announced support for X Windows, "Apple will have to follow suit if it wants to continue its close link with Digital," he says.

Since Sun joined, more than 20 hardware and software companies occupy the ranks of X Windows supporters, including Intel. —RH

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Update

Continued from page 9

management system. And that's not all. PC Nomad also comes with its own data dictionary.

Index announces DEC Vaxstation version of its Excelerator system

Index Technology Corp. in Cambridge, Mass., has just written a version of its Excelerator computer-aided software engineering system for Digital Equipment Corp. Vaxstations running under VMS.

Chris Grejtak, vice-president of sales and marketing at Index, says that teams

of Excelerator users developing information systems on multiple Vaxstations can share project and design data concurrently across a Decnet network using the VAX for project storage and analysis. Grejtak says this marks the first move by Index into the 32-bit workstation environment, citing big improvements in the price/performance ratio of 32-bit workstations such as the Vaxstation 2000.

Unisys, Sterling plan to port mainframe data to expert systems

Unisys Corp. and Sterling Software, Inc. will join forces to design a software product that will take mainstream MIS data

base information from IBM mainframes and port it down to expert systems and Unisys 1100 systems.

Porting data from an IBM mainframe to a specialized LISP workstation usually spells trouble, requiring major conversions and reprogramming or even rekeying data into an artificial intelligence-based machine. The Unisys/Sterling program will stem from the Unisys Knowledge Systems division, which will use Sterling's Answer/DB, a data link and extractor that runs on IBM mainframes, to develop the connection between IBM systems and Unisys machines running AI applications.

The initial program will connect Explorer, a LISP processor from Texas In-

struments, Inc., to the IBM Systems Network Architecture (SNA) environment, using a 3270 SNA link.

Multiflow machines use very long-instruction word scheme

High-speed computing has another player in Multiflow Computer, Inc., which recently introduced its Trace family of Unix-based minisupercomputers. Of software interest is Multiflow's statement that its machines make use of a very long-instruction word architecture and a compacting compiler that the company claims packs an instruction word up to 1,024 bits wide, enabling the machines to handle up to 28 operations simultaneously.

Multiflow says that to get around conditional jumps, a problem apparently tied to overlapped executions, Multiflow's Trace Scheduling compiler picks the most probable path that the code will take and adds compensation code for the lines that do not follow. Multiflow says the code is then compressed into a very long-instruction word architecture.

Apple independent software firm to spark third-party applications

In a move aimed at sparking the creation of additional third-party application software for its Macintosh and Apple II microcomputers, Apple Computer, Inc. is planning on creating an independent software company that will market both Apple and third-party-developed applications software under Apple's own label.

According to Apple, a number of small companies are currently laboring to produce creative new programs for Apple machines without the resources to finish them. That is where the new company will step in to help.

IIA, ADAPSO merger probable; Computer Associates to buy Uccel

If you do not think the software industry is getting any bigger, think again. The Information Industry Association (IIA) and ADAPSO have expressed the urge to merge, probably in 1988. The resultant organization of 1,400 vendors would be "the largest information-related association of its kind in the nation," according to an official letter issued by the organizations.

Speaking of mergers, Computer Associates International, Inc., a Garden City, N.Y., vendor of mainframe systems software, is swapping stock to buy Dallas-based competitor Uccel Corp. The acquisition is the high watermark in a series of software company purchases by Computer Associates in the past few years that has also taken them into the microcomputer software market.

To give an idea of the size of the new software venture, analysts estimate the combined revenue of the two companies will reach \$700 million this year, almost double that of the independent software industry's next biggest revenue maker, Microsoft Corp.

"The merger means the only credible competition in many systems software areas will be IBM, which has announced it will increase software tool prices," says David Thomas, an associate securities analyst at Hambrecht & Quist, Inc. in New York.

"The result could be duopolistic software systems market," he says. — SK

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CULLINET SOFTWARE
D. APPLETON COMPANY, INC.
DATA ARCHITECTS INC.
DIGITAL EQUIPMENT CORP.
DISUS
DUPONT IEA
ERRICO TECHNOLOGIES, INC.
INTERACTIVE DEVELOPMENT
ENVIRONMENT (IDE)
INDEX TECHNOLOGY, CORP.
INFOMODEL
INTEGRATED SYSTEMS, INC.

KEN ORR & ASSOCIATES
KNOWLEDGEWARE-TARKENTON, INC.
LEADING SOFTWARE TECHNOLOGIES, INC.
LEARMONTH & BURCHETT MANAGEMENT
SYSTEMS (LBMS)
MANAGERS SOFTWARE PRODUCTS
MCDONNELL DOUGLAS, ISG
META SYSTEMS, LTD.
NASTEC CORP.
NETRON
ORACLE
PANSOPHIC SYSTEMS, INC.
PHOENIX TECHNOLOGIES, LTD.
POLYTRON, CORP.
RAND INFORMATION SYSTEMS, INC.
SAGE SOFTWARE, INC.
SOFTLAB, INC.
SPS, SOFTWARE PRODUCTS & SERVICES
SYSCORP INTERNATIONAL
TECHNOLOGY INFORMATION PRODUCTS
(TIP)
TEKTRONIX, INC.
TEXAS INSTRUMENTS
TRANSFORM LOGIC, CORP.
VISUAL SOFTWARE
YOURDON

The First Conference on Computer-Assisted Application Development

If you are responsible for developing application software, we want to alert you to revolutionary new technology called Computer-Aided Software Engineering (CASE). CASE extends both 3rd and 4th generation languages by providing automated support to all phases of the development life cycle process.

A key problem with current development tools is the lack of front-end facilities that support the design and specification phases of the life cycle. This lack often results in the introduction of errors in specification and design.

Manual structured specification techniques are often used as an aid in the application design process. However, manually created structured diagrams cannot be converted automatically into code. CASE, on the other hand, provides a technique to automatically convert design specifications into code.

No standards have yet emerged for CASE technology. Different software vendors are offering many approaches. The CASE Symposium (CASES) will present the different approaches being used for design automation. In three intensive days, you will be able to evaluate, compare and contrast these approaches and to incorporate this new technology effectively within your development methodology.

Please read this brochure for a more complete description of this major new conference. If you're involved in programming, you need to be aware of this important field and how it can improve the quality and reliability of your organization's program.



A Digital Consulting, Inc. Conference©

Geo Schussel
Dr. George Schussel
President
Digital Consulting, Inc.

Carma McClure
Dr. Carma McClure
Author and Lecturer
Software Maintenance:
The Problem and Its Solution

Computer-Aided Software Engineering Symposium

Boston, September 21-23, 1987 | San Francisco, October 27-29, 1987

WHAT YOU SHOULD KNOW ABOUT CASE TECHNOLOGY

CASE Technology brings the same benefits to software development as CAD/CAM has brought to manufacturing. Both CAD/CAM and CASE enforce a disciplined, engineering approach to the development of systems. Both use interactive graphical design techniques, design checking rules, encyclopedias of design elements, and simulation. These techniques are applied and enforced throughout all phases of the design, development, manufacturing, testing, deployment, and maintenance process.

CASE provides a process and tools for every part of the software development life cycle. Figure 1 shows some key functions provided by CASE products. Products which implement ALL of these functions will be discussed and analyzed at CASES.

Front-end CAD/CAP diagramming techniques: Most CASE tools utilize computer-aided design and programming techniques to create diagrams of the system design. Analysts are able to create, verify, and revise drawings on an interactive screen. Specifications for the system are stored in graphical form in a central dictionary or encyclopedia.

Design analyzers: The function of the design analyzer is to detect internal inconsistencies, ambiguities, and omissions in the design specifications. Design analyzers in current CASE tools are being improved rapidly to incorporate smart editors, intelligent assistants, and expert systems.

Code generators: Many CASE tools are moving toward the incorporation of a code generation module which generates application code automatically from consistent design specifications.

SPECIFICATIONS

Encyclopedia or repository: A number of CASE tools incorporate an automated encyclopedia which is used as a central repository of knowledge about the enterprise and its structure, functions, procedures, data models, data entities, entity relationships, process models, etc. Sufficient detail is maintained about the design of a procedure so that program code for that procedure can be generated automatically.

Expert Systems: A few CASE tools are beginning to incorporate expert systems that apply inference processing to a knowledge base which contains data and rules. Initially, expert systems are being used to detect inconsistent or incorrect data base actions. However, they are likely to be extended to support the front-end graphical design process, and to generate efficient code.

Methodologies: CASE tools are moving toward the incorporation of a disciplined methodology that guides the analyst step-by-step in the application of the tool. The application of a comprehensive methodology brings a more standardized approach to systems development, and enables management to gain better control over the development process.

The functions of CASE tools are described in Figure 1 below. All of these concepts and the tools which implement them will be discussed and analyzed in CASES.

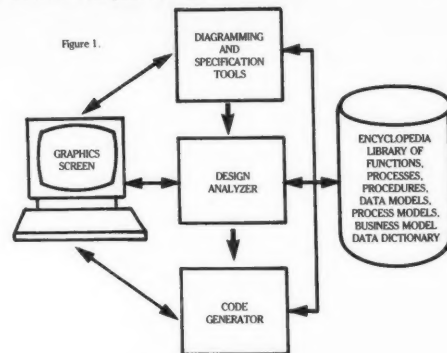


Figure 1

Day One of the CASE Symposium provides a comprehensive review of the CASE technology, the characteristics of CASE systems, and the CASE development environment. The presentation will show you how these major components are integrated in specific products.

MAJOR TRENDS IN CASE TECHNOLOGY

The design of CASE products is being driven by important technology trends in the following areas:

Human factoring: Major improvements have been made in human interfaces, including simplified, intuitive command interfaces, elimination of alien syntax, use of graphics, etc.

PC orientation: Many CASE products are available as intelligent workstations within the PC environment. The PC environment provides dedicated processing capability, decisecond response time, superior graphics, and access to thousands of PC software support packages.

Design automation: Front-end graphical design techniques are being improved rapidly. These support the specification of systems in graphical form using consistent diagrams that are sufficiently complete to be converted automatically into code.

Artificial intelligence: CASE tools are making increasing use of AI techniques, including the incorporation of expert system shells and a knowledge base of rules of interface.

These technology trends are converging to produce a new generation of tools that are fundamentally different from previous technology. Digital Consulting's lecturers and consultants will alert you to the significance of these new trends in technology, and will show how individual CASE products incorporate these new ideas.

DAY ONE

Day One

The first day of CASE Symposium provides a complete review of the technology; the major trends, characteristics, components, environment, changes to the software life cycle, productivity benefits, and future issues.

Days Two and Three

Days two and three of CASES consist of one-hour product presentations from all of the leading developers of CASE products. Consultants from DCI will be available to direct you to the right presentations and answer your questions on CASE technology. Distinguished guest speakers, including Daniel Appleton, Richard Carpenter, Dr. George Schussel, Ken Orr, Ronald G. Ross, and Edward Yourdon, will appear during the luncheon and afternoon to share their insights into where this technology is heading. Evening hospitalities will allow you to actually see and test the leading CASE products hands-on.

DAY ONE-SEMINAR



Dr. Carma McClure
Guest Speaker

Dr. Carma McClure, internationally known author and lecturer will lead the CASE Symposium overview. Dr. McClure specializes in software methodologies, software law and project management. Since 1974, she has served as a software consultant to the industry, and has worked with major corporations including Time, Inc., Blue Cross/Blue Shield, Western Electric, GTE, Bell Labs, Bellcore, Diebold, Nixdorf, Texas Instruments, Digital Equipment Corp., and Dupont.

Dr. McClure is a software engineer and has taught software engineering courses at Illinois Institute of Technology (IIT) and Northwestern University. She has co-developed several video-based training courses on structured techniques, structured design methodologies, and software maintenance. She has also served as a National ACM Lecturer and has conducted numerous professional seminars on software maintenance. Her publishing credits include numerous articles on software and six books, including four co-authored with James Martin.

CASE SEMINAR OUTLINE

1. Overview of Computer-Aided Software Engineering (CASE)

2. **CASE Technology**
 - a. What is CASE Technology
 - b. Automation of Automation
 - c. Automation of Software Life Cycle
 - d. Linking Design Automation and Program Automation
 - e. Total Solution to Software Crisis
 - f. Evolution of CASE Technology
 - g. Current CASE Issues

3. Characteristics of CASE Systems

- a. New Software Development Environment
- b. Graphic Design Capabilities
- c. Central Information Repository
- d. Tightly Integrated Tool Sets
- e. Full Life Cycle Coverage

- f. Prototyping Support
- g. Automatic Code Generation
- h. Automatic Correctness and Consistency Checking
- i. Key CASE System Concepts
- j. CASE System Comparison Criteria

4. Review of Vendor Products

A discussion of how to categorize CASE products:

- a. CASE Toolkits
 - Analyst Toolkits
 - Programmer Toolkits
- b. CASE Workbenches
 - Software Engineering Workbenches
 - Information Engineering Workbenches
- c. CASE Methodology Companions
 - Documentation Systems
 - Guidance Systems

5. CASE Environment

- a. PC Workstations
- b. PC Tool Sets
- c. Mainframe Tool Sets
- d. PC-Mainframe Link
- e. One, Two, and Three Tiered Architectures

6. Changes to the Software Life Cycle

- a. Front End Loading - Increased Emphasis on Analysis Phase
- b. Object-Oriented Program Design
- c. Minimizing Manual Implementation Tasks
- d. Rapid Iterative Prototyping
- e. Minimizing the Need for Testing
- f. Merging Development and Maintenance Strategies

7. CASE Productivity Benefits

- a. Increasing Productivity by a factor of 20
- b. Getting More from Each Developer

- c. Reducing the Change and Maintenance Effort
- d. CASE Studies on CASE
- e. Short and Long Term Benefits

8. Related Technologies

- a. CASE's Dominant Role
- b. Software Reusability as a Development Methodology
- c. Role of COBOL
- d. Absorption on Fourth Generation Technologies
- e. Incorporation of Fifth Generation Technologies
- f. Emerging Issues

9. Future Trends

- a. Habitable Environment - Beyond User Friendly
- b. Intelligent Training Systems
- c. Intelligent Methodology Drivers
- d. Software Reusability - Key to High Productivity

ABIVENT

Anatool automates SSA (Yourdon) methodology with hierarchical Data Flow Diagrams, an integrated Data Dictionary, and Standard Specifications (optional structured English). Consistency checks maintain accuracy between parent and child diagrams or between data stores and connecting flows by cross-checking the dictionary definitions.

ADPAC COMPUTING LANGUAGES, CORP.

Adpac Computing Languages Corporation develops, markets and services technology support tools for the IBM mainframe operating under MVS. Adpac's CASE tools (DFDP and DESIGN) provide a front-end CAD/CAM diagramming technique that assists analysts in drawing any type of diagram and design analysis with the capability to verify the contents of diagrams.

AION CORP.

Aion Corporation of Palo Alto provides a complete line of inference-based programming tools for the design, development, delivery, and maintenance of MVS/TSO, MVS/CICS, IMS DB/DC, VM/CMS, and PC/DOS applications. Aion's ADS environment will be presented with special attention to issues of cross-system transportability, life-cycle management, economic benefits of inference-processing in conventional application development, and opportunities for advanced expert-systems applications.

AMERICAN MANAGEMENT SYSTEMS

AMS is a major computer services firm specializing in applications development. AMS's Life cycle Productivity System (LPS) integrates productivity tools from AMS and other vendors for strategic system planning, design, development, maintenance, and project management. LPS produces all deliverable work products required by most methodologies. Major portions of LPS operate on PC's implementation, configuration control, and foundation software modules operate on IBM mainframes.

AGS MANAGEMENT SYSTEMS, INC. (AGS/MS)

AGS/MS is recognized as the world's leader in systems development methodologies and project management systems. The MULTI/CAM Systems Development Workstation created by AGS/MS integrates software development tools, software design and production models, and project management capabilities into a unified automated work environment.

APPLIED BUSINESS TECHNOLOGY CORP.

Applied Business Technology Corp. specializes in providing decision support management tools, consulting and training. Since 1983 they have marketed Project Workbench, a project management system which integrates Gantt charts, dependency (CPM) networks, and resource spreadsheets. Workbench produces presentation quality graphics, and operates on IBM PCs/compatibles and all major LANs.

ARTHUR ANDERSEN & CO.

The Arthur Anderson Worldwide Organization provides professional services in accounting and audit, tax and management information consulting. Arthur Andersen will demonstrate Design/1, a PC based software tool which assists in the planning, analysis and design phases of the on-line system life cycle, and will present Install/1, which addresses the implementation and support phases.

ARTHUR D. LITTLE, INC.

The PC-Based tool IRMA (Information Resource Management Aid) supports Arthur D. Little's methodologies for strategic systems planning and data modeling, as well as structured analysis and prototyping. The planning methodology relates business objectives to systems opportunities. The tool has advanced data modeling features and interfaces with DB2, IMS, IDMS, and Datacom.

ARTHUR YOUNG & COMPANY

Arthur Young is an international accounting, tax and management consulting firm and is working with KnowledgeWare to develop the Information Engineering Workbench (IEW). In addition to using the IEW for systems building and marketing the products internationally, the AY/IEW was developed to provide methodological and management underpinnings for information engineering.

ASYST TECHNOLOGIES, INC.

THE DEVELOPER, an IBM PC-based workbench software provides a generic multi-user automated support for the entire systems development process. As opposed to a methodology driven tool, THE DEVELOPER allows the use of any methodology at all desired levels of compliance and rigor. Its CUSTOMIZER module, coupled with its Import/Export functions, allows an easy link to other products such as code generators and central data dictionaries.

THE CADWARE GROUP, LTD.

The CADWARE Group designs, produces, and markets rule-based modeling tools for complex systems. Managers, planners, systems analysts, and designers use these tools to help manage the complexity of defining and evaluating mission-critical business, industrial, and technical systems. CADWARE's PC based tools adapt to the system definition methods and practices that you use. Models and designs may be used to automatically generate: data bases, operational software, and system documentation.

CAP GEMINI SOFTWARE PRODUCTS, INC.

CAP Gemini exists exclusively to market the MultiPro System. MultiPro is an application development environment integrating PC-based workstations into the IBM mainframe environment. MultiPro is an open system, tailorable to any development life cycle and it uniquely addresses the business aspects of system development. MultiPro automates aspects of the analysts workstructure, consolidating project documentation within its mainframe resident Project Library System.

CGI SYSTEMS, INC.

PACBASE, is a full life-cycle CASE product. It integrates: Mainframe and PC based analysis and design workstations for the development and maintenance of application specifications through active prototypes, a centralized enterprise-wide dictionary that controls and manages all business specifications, and generators which transform the dictionary-based specifications directly into complete COBOL applications, including all code and documentation.

Presenter

Abvent
Adpac Computing Languages Corp.
AGS Management Systems

Aion
American Management Systems
Applied Business Technology
Arthur Andersen
Arthur D. Little
Arthur Young & Co.

Asyst Technologies, Inc.
The Cadware Group, Ltd.
Cap Gemini Software Products, Inc.
CGI Systems, Inc.
Chen & Associates

Cortex Corp.
Cullinet Software
D. Appleton Company, Inc.

Data Architects, Inc.
Digital Equipment Corp.

Disus
Dupont IEA

Errico Technologies, Inc.
Interactive Development
Environment, Inc. (IDE)
Index Technology Corp.

Info Model
Integrated Systems, Inc.
Ken Orr & Associates
Knowledgeware

CHEN & ASSOCIATES, INC.

Chen & Associates, Baton Rouge, Louisiana, is a leading company providing products, training, and consulting in data-oriented system development. Products (PC-based) to be presented are: ER-Designer, which defines your information requirements in Entity-Relationship diagrams; SCHEMAGEN, which generates schemas for your database systems (from micro-based to mainframe based); Normalizer, which normalizes data or words.

AND THREE

CORTEX CORP.

CorVision is an application development system that automates the entire software development life cycle for the DEC VAX/VMS environment using a technique called Picture Programming. Picture Programming allows DP professionals to visualize an application by diagramming the design and then automatically generating a production-ready application directly from the pictures. CorVision is built on application generator technology for the DEC VAX Application Factory.

Product

ANATOOL
DFDP, DESIGN
MULTI-CAM SYSTEMS
DEVELOPMENT WORKSTATIONS
ADS ENVIRONMENT
LIFECYCLE PRODUCTIVITY SYSTEM
PROJECT WORKBENCH
DESIGN/1, INSTALL/1
IRMA
INFORMATION ENGINEERING
WORKBENCH
THE DEVELOPER
RULE-BASED MODELLING TOOLS
MULTIPRO
PACBASE
ER-DESIGNER, SCHEMAGEN,
NORMALIZER
CORVISION
IDMS/ARCHITECT
DATA RESOURCES, LEVERAGE,
RAP, DDM
EXSYS
INTEGRATED APPLICATION
DEVELOPMENT TOOLS
DEFT
CUSTOMIZED SOFTWARE
APPLICATIONS PROGRAMS
AMS-TEAM
SOFTWARE THROUGH PICTURES

EXCELERATOR, EXCELERATOR RTS,
CUSTOMIZER, NEW INTERFACE
PRODUCTS
CASE PROCODE
AUTOCODE
DESIGN MACHINE
INFORMATION ENGINEERING
WORKBENCH/WORKSTATION

Presenters are continued on pages 6 & 7.

CULLINET SOFTWARE

Cullinet is a developer and integrator of software and AI technology for database, applications, and information center products. IDMS/ARCHITECT is Cullinet's family of Computer-Aided Software Engineering (CASE) Products. IDMS/ARCHITECT addresses the development process where it begins - with systems analysis and design. The first member is a PC-based, graphics oriented tool which aids in the logical design and physical implementation of databases and applications. It supports Entity modeling, Relational Data Analysis, the automatic generation of schematic syntax for IDMS databases, the definition of applications including logical and physical transactions, flow of control, program dialogs, and maps.

D. APPLETON COMPANY, INC.

D. Appleton Company (DACOM) solves business responsiveness problems by applying asset-management principles, practices, and tools to information. DACOM methodologies for information system planning, RAP, and development, PDM when coupled with Data Resource LEVERAGE (data and activity modeling with the JANUS software), enables teams of professionals to use and reuse data assets for improved productivity.

DATA ARCHITECTS, INC.

Data Architects, Inc. (DAI) is a systems consulting firm that offers both customized and packaged solutions to its international client base. DAI and EXSYS Inc. will demonstrate EXSYS - the Expert System for business software development. EXSYS makes possible the development of systems directly from statements of facts in English. EXSYS eliminates programming and combines analysis, design, and testing into a comprehensive one-step development approach. EXSYS is the one product which supports the entire life cycle.

DIGITAL EQUIPMENT CORPORATION

As a leading computer manufacturer, Digital provides a range of integrated Application Development tools for solutions to business and engineering problems. The unique offerings are workstation based and address all aspects of the Applications Development Life Cycle. They are integrated into the VAX hardware, software and network architecture to provide enterprise wide solutions.

DISUS

Delft is a suite of Computer Assisted Software Engineering (CASE) tools, widely used for systems analysis/design in North America and Europe. Delft supports dataflow, program-structure and entity-relationship diagrams, a data dictionary and forms design. Development projects using Delft have reported significant productivity gains in all phases of system building: analysis, design, development, documentation and maintenance.

DUPONT INFORMATION ENGINEERING ASSOCIATES

DuPont Information Engineering Associates (IEA) offers high-quality customized software applications programs for DEC/VAX systems, delivered in under 120 days with an up-front fixed price, and a complete money-back guarantee from DuPont. DuPont/IEA has developed and installed successful applications programs for major Fortune 500 companies, as well as for dozens of DuPont internal operations. And every project has been delivered on time and on budget. Our track record to date? Success 40, Failures 0.

ERRICO TECHNOLOGIES, INC.

AMS-TEAM is a truly integrated and fully comprehensive CASE product completely supporting the IBM mainframe environment. CONSTRUCTION COMPONENT: Helps design as a team . . . Complete repository . . . Reusable parts . . . Interfaces to PC diagramming tools . . . Generates and documents entire Batch/Online Program efficiently . . . MANAGEMENT COMPONENT: Automatically monitors and collects management information . . . Enforces your standards . . . Tracks your development phases . . . Easily migrates with import features . . . AMS-TEAM learns how you develop software.

INTERACTIVE DEVELOPMENT ENVIRONMENT (IDE)

IDE's product, Software through Pictures, is a set of integrated graphical editors and error-checking tools supporting structured analysis and design methods. The editors are linked to a Data Dictionary supporting definition of names, types, constants and associated text. Users can generate Ada declarations and define process and module templates to generate specifications.

INDEX TECHNOLOGY CORPORATION

Index Technology Corporation, leaders in the CASE market, develop and market a range of products that automate the systems development life cycle. The product line includes products that support strategic systems planning, analysis and design of systems, project planning and a series of NEW interface products that provide linkages to leading code and application generators. These products provide an extensible, flexible and integrated systems development environment for large and small projects in both the DOS and VMS environments.

INFO MODEL

Info Model is an information engineering company that has developed a comprehensive methodology for information resource management, systems development, and information systems planning. To support this methodology Info Model IBM PC software has been developed. Info Model will present an overview of its methodology and the capabilities of its product.

INTEGRATED SYSTEMS, INC.

AutoCode focuses on the needs of Real-Time Software Engineers and addresses all steps from analysis to design, simulation and code generation. The graphical specification environment features engineering block-diagrams, data flow/control flow, state transition, and process descriptions. Ward-Mellor real-time software methodology with Boeing-Hatley extensions are included in an environment where simulation and analysis can be performed for design verification; and real-time code in C, Ada or Fortran can be generated automatically.

KEN ORR & ASSOCIATES, INC.

Ken Orr & Associates, Inc. specializes in building integrated software engineering environments that incorporate technology, tools, and training for maximum productivity. The Design-Machine is an IBM PC-based CASE tool that automates the requirements and analysis phase of systems development. It automatically generates design deliverables from system requirements recorded in an integrated design database. It has embedded software engineering rules and built-in quality control.

KNOWLEDGEWARE, INC.

KnowledgeWare, Inc. provides software tools to automate MIS/DP. The Information Engineering Workbench/Workstation uses CASE techniques automating creation, validation, and maintenance of decomposition, entity-relationship, data-flow, and action diagrams. The expert system module validates process and data models against hundreds of structured logic rules, deciphers diagram meaning, and stores this in the knowledge-base immediately reflecting changes in any diagram.

Presenter	Product	Presenter	Product
Leading Software Technologies	THE INTELLIGENT ASSISTANT (TIA)	Netron Inc.	NETRON/CAP
Learnmonth & Burchett Management Systems (LBMS)	AUTO-MATE PLUS	Oracle	SQL DESIGN DICTIONARY
Managers Software Products (MSP)	MANAGER, MANAGER VIEW	Pansophic Systems, Inc.	TELON
McDonnell Douglas ISG	PROKIT WORKBENCH	Phoenix Technologies, Ltd.	PRE-C, PFI86, PFORCE, PLINK86PLUS, PSOURCE
Meta Systems, Ltd.	PSL/PSA. STRUCTURED ARCHITECT, STRUCTURED ARCHITECT - INTEGRATOR	Polytron Corp.	POLYMAKE, POLYLIBRARIAN
Nastec Corp.	DESIGNAID	Rand Information Systems, Inc.	RAND DEVELOPMENT CENTER (RDC)
		Sage Software, Inc.	APS DEVELOPMENT CENTER
		Softlab, Inc.	MAESTRO

LEADING SOFTWARE TECHNOLOGIES, INC.

The Intelligent Assistant (TIA) is a rule based expert system which generates entire applications from a description of inputs, outputs and processes. As a backend CASE product, these descriptions may be gathered using any front-end CASE product. TIA then produces the entire system, 100% of code (ANS 74/COBOL II), JCL and documentation in one CPU pass. Batch, DBMS, and online systems are supported.

LEARNMONTH & BURCHETT MANAGEMENT SYSTEMS (LBMS), Inc.

AUTO-MATE PLUS, the leading edge in CASE technology, provides in-depth solutions for automating software development. Created by LBMS, AUTO-MATE PLUS, a PC based tool, provides full support for systems analysis, logical design (including inter-active data normalization) and automatic physical design and DDL syntax generation for ADABAS, DB2 and IDMS for easy export to the data dictionary. All mouse-driven graphics are enhanced with catalogues.

MANAGER SOFTWARE PRODUCTS (MSP)

MSP is the world's leading vendor of a CASE environment driven off mainframe Data and Information Resource Management technology. The MANAGER Family of Products (PC and Mainframe) is dedicated to automating all phases of the Systems Life Cycle, from Strategic Information Planning to the generation of enabled code. MSP will be presenting the MANAGER Family of products including managerVIEW, the Intelligent Workstation based graphical Information Engineering tool driven by the Central Knowledge Base resident on the Corporate Dictionary. managerVIEW is integrated with the Mainframe Corporate Dictionary and will also run on the IBM PC Family and the PS/2.

MCDONNELL DOUGLAS INFORMATION SYSTEMS GROUP

McDonnell Douglas Information Systems Group is focused on providing single-source solutions representing a tailored framework for software engineering. ProKit WORKBENCH is a new IBMPC-based information system that automates the application of proven structured techniques to the strategic planning, analysis, and design phases of the system life cycle.

META SYSTEMS, LTD.

Meta Systems, Ltd. offers integrated micro/mainframe-based productivity (CASE) software, which completely automates the entire process of developing information systems. Our customers include some of the world's most prestigious companies and government/military organizations. They use PSL/PSA (host based), Structured Architect (PC graphics tools), Structured Architect-Integrator (on the host), and other Meta tools to develop large and complex systems, to reverse engineer old code, and to do enterprise wide data modeling.

NASTEC CORPORATION

Nastec Corporation, originators of the CASE tools concept, develop tools for both commercial and aerospace/defense/engineering software developers. The DesignAid analyst/programmer workbench is a multi-user development system operating in the IBM PC and DEC/VAX environments. DesignAid automates software development from requirements definition through code generation, including documentation development and project management.

NETRON, INC.

The NETRON/CAP Development Center is a CASE system for building custom, portable COBOL software using a frame-based software engineering process called Bassett Frame Technology. NETRON/CAP unifies the prototyping/development/maintenance life cycle into an automated specification procedure. The open design architecture allows unlimited automation of additional application functionality for IBM mainframes and PCs, VAX systems and Wang VS minis.

ORACLE CORPORATION

SQL*Design Dictionary is an application written in the RDBMS named ORACLE whose purpose is to assist analysts and designers record the details of an enterprise model (both the data model and functional hierarchy). It generates SQL table definitions automatically and allows for documentation during each stage of the system development life cycle.

PANSOPHIC SYSTEMS, INC.

Pansophic Systems, Inc., a leading vendor of software products to improve application productivity and control, will present TELON. The TELON application development system captures design specifications to generate COBOL or PL/I applications. TELON assists the transition from analysis to design by providing interfaces to leading front end analysis tools. TELON components include: Directory, Data Administration, Screen/Report Painters, Prototyping, Specification Facilities, Automated Documentation, Generator, and Test Facility.

PHOENIX TECHNOLOGIES, LTD.

Phoenix, known worldwide for professional programmers tools such as Pre-C, Pfix86plus and PforCe, offers a full line of high-performance, easy-to-use micro-development tools that help programmers more efficiently deliver the best applications possible. Plink86plus, the only linkage editor with advanced capabilities, is considered the industry standard. Psource, Phoenix's recently announced software development management system, provides control and reporting capabilities previously available only on mainframe and minicomputer systems.

POLYTRON CORP.

POLYTRON offers the leading configuration management system for MS/DOS PC and VAX/VMS software development. PVCS maintains versions and revisions of software systems. PolyMake automatically rebuilds any desired version of the system. PolyLibrarian maintains libraries of reusable object modules. The tools work together or independently with ANY language and your existing tools.

RAND INFORMATION SYSTEMS, INC.

Rand Information Systems, Inc., a computer software and services company, specializes in productivity software and system development. The Rand Development Center (RDC) is a programmer workbench and tool management framework which supports application development under the most popular TP monitors and data base management systems in the IBM mainframe environment.

SAGE SOFTWARE, INC.

Sage Software, Inc. develops, markets, and supports a family of CASE tools for users of IBM and compatible computers. The company's product family (known as the APS Development Center) encompasses the software development cycle and supports the design, prototype construction, coding, testing, and maintenance of COBOL-based applications software.

SOFTLAB, INC.

Softlab, Inc., will present MAESTRO, the integrated Software Engineering Environment. MAESTRO organizes and manages the software cycle through real-time project management, time accounting, and your unique standards. MAESTRO integrates customizable tools for design, coding, testing, documentation, and maintenance, is language independent, and fits in numerous hardware and software environments.

AND THREE

Presenter	Product	Presenter	Product
Software Products & Services (SPS)	EPOS	Texas Instruments	INFORMATION ENGINEERING FACILITY
Syscorp International	MICROSTEP	Transform Logic Corp.	TRANSFORM
Technology Information Products	TIP CREATE, TIP DEFINE, TIP PLAN, TIP RELATE	Visual Software	VS DESIGNER
Tektronix, Inc.	INTEGRAL CASE SYSTEMS SOLUTIONS	Yourdon	ANALYST/DESIGNER TOOLKIT

SPS SOFTWARE PRODUCTS AND SERVICES, INC.

EPOS is a fully integrated life-cycle development support environment for requirements engineering, software/hardware design, implementation, long-term maintenance, and project management. Providing traceability from requirements through design, EPOS automatically generates code for Ada, Pascal and FORTRAN, plus complete graphic and textual technical and management documentation. Available for mainframes, minis and PCs, EPOS provides a proven disciplined framework for large-scale development.

SYSCORP INTERNATIONAL

MicroSTEP lets you build a graphical specification, from which it generates executable PC-based business applications. No human programming is needed to generate, compile, and link a complete system, including screen management, relational database interface, error recovery/restart, report writing. Specification requires AT, Hercules, mouse. Application execution requires XT.

TECHNOLOGY INFORMATION PRODUCTS

TIP provides completely integrated methodologies and software for system planning, analysis, design, implementation, and maintenance. TIP PLAN helps identify, define, and schedule the systems and data bases needed to meet a business' goals and objectives. TIP DEFINE graphically describes a system's functional and information requirements. TIP RELATE automates building the normalized relational data model. TIP CREATE then generates COBOL/PLI programs.

TEKTRONIX, INC.

Tektronix, Inc., has participated in the evolution of the computer-aided software industry for over a decade. Tek already has an established CASE base in the engineering and scientific market sectors; and is currently exploring other opportunities and applications. Tek's family of software development tools is named "Integral CASE Systems Solutions".

TEXAS INSTRUMENTS

Texas Instruments' integrated CASE product, The Information Engineering Facility, is designed to automate the complete systems development life cycle. It consists of a powerful mainframe encyclopedia and PC-based, graphical toolsets to support analysis and design. TI can demonstrate today the major components of this product including: strategic planning, analysis, design, COBOL code generation, and database generation.

TRANSFORM LOGIC CORPORATION

Transform Logic Corporation's TRANSFORM product family automates COBOL application software design, development and maintenance in IBM mainframe environments. Transform Logic will present the concepts behind development automation and application base management using TRANSFORM. Data driven design architecture, environment independence, and design prototyping are features of this approach.

VISUAL SOFTWARE, INC.

Visual Software, Inc. develops and markets an integrated family of personal CASE tools for the multi-user IBM PC environment. The VS-Designer is the first CASE workbench to support different methodologies simultaneously from a LAN based information repository. Visual's unique intelligent architecture for personal adaptability enables the product to adapt to standard user-defined methodologies. It further reduces the learning curve by modifying the user interface to operate like well known word processors.

YOURDON DIVISION OF DeVRY

The YOURDON Analyst/Designer Toolkit, supports both the traditional and real-time YOURDON Techniques and allows for the creation of all the diagrams associated with the techniques. The diagramming facilities of the Toolkit are fully integrated with a powerful project dictionary which features dBase III compatibility. The Toolkit also provides error checking to insure the accuracy of diagrams and dictionary entries.

SPECIAL CASE VIDEOTAPE OFFER

The CASE Symposium was featured in a recent edition of the *Windows on Wall Street* television series, which highlights emerging business opportunities and technologies. All of the Symposium speakers, several DCI consultants, and a representative selection of the vendors and attendees were interviewed by series host Robert Chesney on CASE technologies, major business issues and opportunities created by the emergence of CASE, and future trends in the area. The show provides a revealing look at this leading-edge technology, as well as a preview of what to expect at the CASE Symposium. Individuals interviewed include Dr. George Schussel, Dr. Carma McClure, Dr. Peter Chen, Ron Ross, and James Davey. We are pleased to offer an **expanded** version of this first-ever television look at CASE on videotape, featuring an hour of additional footage not shown during the original broadcast.

This 90-minute tape is available from DCI for just \$39.00 prepaid. If you order now, you will be able to get a flavor of what to expect at this fast-paced conference before you register to attend. You will also gain valuable insights into this exciting new technology from many of the leaders in the field. This videotape can be used within your organization as an aid to educate your management and staff on the realities and enormous potential of CASE. To order your copy, send \$39.00 to: Digital Consulting, Inc. 6 Windsor Street, Andover, MA 01810. **All orders must be prepaid.**

Guest Speakers



DANIEL S. APPLETON

President

D. Appleton Company, Inc.

Daniel S. Appleton is President of D. Appleton Company, Inc. (DACOM). He specializes in industrial modernization and data resource management.

Prior to establishing DACOM in 1979, Mr. Appleton served as Director for Strategic Business Planning at the Borg-Warner Energy Equipment Group and as Director of Management Information Systems for the eight worldwide manufacturing facilities of Byron Jackson Pump. He was also Manager of Systems Development at Litton Ship Systems, and he spent time in Washington working for the CIA and later in the office of the Assistant Secretary of Defense, Comptroller, developing systems for planning, programming, and budgeting major agency and DoD programs.

Mr. Appleton is a Fellow of the Institute for the Advancement of Engineering, the Chairman of the Technical Council and a member of the Board of Directors for the Computer and Automated Systems Association (CASA) of the Society of Manufacturing Engineers (SME), and an active member of both the IEEE and the American Association for Artificial Intelligence.

Mr. Appleton has published numerous technical papers and articles on manufacturing automation and database management, and he is the most published author in *Datamation* Magazine, having had 19 articles published.

RICHARD A. CARPENTER

President/CEO

Index Technology Corp.



Richard A. Carpenter is President and Chief Executive Officer of Index Technology Corporation, a three-year-old company that develops and markets a range of computer-aided software engineering (CASE) products. Mr. Carpenter co-founded the firm in 1983 with the goal of utilizing evolving technology to develop and market innovative products that would help people build better systems more efficiently. He was one of the principal designers of Excelsator, the company's first product.

Before founding Index Technology, Mr. Carpenter co-founded Index Group, a consulting firm specializing in the use of information technology to support strategic business objectives. In his fifteen years there, he worked with Fortune 500 companies to design and implement custom information systems, utilizing a wide range of computer technologies to meet their key business requirements. Mr. Carpenter received master's and bachelor's degrees in Electrical Engineering from MIT, where he also served as an instructor and researcher in the computer sciences area.



KEN ORR

President

Ken Orr & Associates, Inc.

Ken Orr is President of Ken Orr & Associates, Inc., which specializes in software engineering environments that integrate technology, tools, and training for maximum productivity. As one of the principal developers of the Data Structured Systems Development (DSSD) methodology, he directs all research and development activities for advanced DSSD technology and computer-aided software engineering (CASE) tools. Mr. Orr is a leader in the systems technology "structured revolution", the forefront of the information science field. With a mathematics background, he's held key positions in management consulting, state government, and software development. He currently consults with major clients - including Pacific Telesis Group, Bell Communications Group, and Santa Fe Railway - on strategic systems planning, data architecture, and CASE.

A frequent speaker at international conferences and seminars specializing in systems planning and development, Ken is the author of *Structured Systems Development*, *Structured Requirements Definition*, and *The One Minute Methodology*. He has also been a contributing editor to *INFOSYSTEMS* magazine and has written for *COMPUTERWORLD*, *SOFTWARE NEWS*, and other industry trade publications.

Guest Speakers

RONALD G. ROSS EDITOR DATA BASE NEWSLETTER



Ronald G. Ross, the founder of Ronald G. Ross Associates of Houston, TX, is one of the world's leading researchers and commentators on data management topics. His books (*Data Base Systems: Design, Implementation, and Management* and *Data Dictionaries and Data Administration*) and his monograph on IBM's IMS have been read by thousands of data management professionals worldwide. His newest book, on entity modeling and logical database design appears this year.

Mr. Ross is also editor of the *Data Base Newsletter*, published by Database Research Group, Inc. of Boston, MA. The Newsletter has been providing practical insights and accurate predictions in the data management field for over thirteen years. Mr. Ross has been Editor since 1977.

Mr. Ross provides state-of-the-art services in entity modeling and logical database design, strategic data planning and data administration. Mr. Ross is also the creator of coordinated methodologies for database development in these areas.



DR. GEORGE SCHUSSEL President Digital Consulting, Inc.

"Schussel has seen many changes in the DBMS field in the last two decades and, in his work, has been instrumental in helping bring about some of them . . . The next few decades will likely be witness to more and more rapid changes in the way information is processed, and when those changes occur, it's a safe bet George Schussel will be there to help the business community adapt."

ICP Interface

DR. GEORGE SCHUSSEL is one of the world's foremost experts in data base management technologies. He is president and founder of Digital Consulting Associates, Inc. a prominent high technology education and management consulting firm that specializes in software productivity tools and is recognized as the world leader in DBMS and 4GLs. Dr. Schussel is also Chairman of the National Database and 4th/5th Generation Language (DB & 4/5GL) Symposia. His influential role in the industry prompted ICP Interface to name him the "Guru of Data Base Management".

As a leading consultant and educator, Dr. Schussel has taught over 25,000 seminar attendees about state-of-the-art data management concepts and technologies. In his consulting practice, he has conducted top-level management studies for AT&T, NCR, New York Blue Cross/Blue Shield, Logica, General Electric, Software AG, Applied Data Research, and many other firms. Dr. Schussel is also a noted futurist with a long track record of making accurate predictions about emerging technology trends years before they occur.

EDWARD YOURDON Vice-President of Planning DeVry, Inc.



Edward Yourdon is Vice-President of Planning for DeVry, Inc., the educational subsidiary of Bell & Howell. Mr. Yourdon has worked in the computer industry for nearly 25 years, including positions with Digital Equipment Corp., and General Electric. He has worked on some 25 different mainframe computers and been involved in a number of pioneering projects.

In 1974, Mr. Yourdon founded his consulting firm, YOURDON, Inc., to provide a forum for educational, publishing and consulting state-of-the-art technology in the computer field. As chairman of the company, he oversaw an operation that trained over 100,000 people in major companies and government agencies around the world. He is the author of 14 computer textbooks, his most recent entitled: *Nations at Risk: The Impact of the Computer Revolution*, which has been excerpted in computer journals in the United States and throughout Europe. Several of his books have been translated into Russian, Japanese and a number of other languages. His articles have appeared in virtually all of the major computer journals, and he is a regular speaker at major computer conferences.

Special Features

5 Key Reasons to Attend the CASE Symposium

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4. Attend guest speaker presentations. Hear industry leaders speak on all aspects of this exciting new technology.
5. Receive free implementation tips from DCI consultants and industry leaders.

WHO SHOULD ATTEND

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- Data Base Administrators
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- Application Systems Managers & Analysts
- Systems Planners
- Executives & Senior Management
- Departmental Managers
- Software Engineers
- Systems Designers

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The suites provide a relaxed environment in which you can ask questions and socialize with industry leaders. Enjoy the hands-on product demos and the chance to relax and share the company of fellow attendees!

PROCEEDINGS

Every symposium attendee will also receive a copy of our 1987 Computer-Aided Software Engineering Symposium Proceedings, a useful resource guide long after the Symposium is over.

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HOTEL INFORMATION



Boston, September 21-23
Boston Marriott Burlington

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OTHER MAJOR DCI CONFERENCES

Computer-Aided Software Engineering Symposium

- Sydney, November 30-December 2, 1987

International Database and 4th/5th Generation Language Symposium

- Frankfurt, November 3-5, 1987
- Dallas, November 16-18, 1987
- Boston, December 1-3, 1987

National Artificial Intelligence Symposium

- Atlanta, December 14-16, 1987

International Connectivity Symposium on Local Area Networks and Micro-Mainframe Links

- London, September 21-23, 1987
- Chicago, October 5-7, 1987
- Auckland, October 19-21, 1987
- Sydney, October 21-23, 1987
- Washington, DC, December 7-9, 1987

National Desktop Publishing Symposium

- Chicago, November 16-18, 1987

Software Futures, Executive Conference

- Boston, August 17-18, 1987

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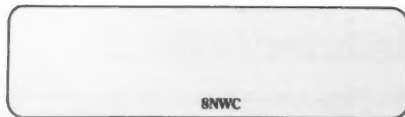
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High-tech help for blind

It is a typical day at the office. You sit down at your computer and log on. A message flashes on the screen signaling that you have received some electronic mail. You look at these electronic messages, and one needs an immediate response. Following the prompts on the screen, you compose a reply and send it.

It is a typical day if you have normal eyesight.

But if you have lost your vision or it is severely impaired, how do you make use of a technology that relies almost entirely on visual signals?

Visually impaired alienated

For many years, computers alienated visually impaired people. More recently, software and hardware products have begun to alleviate that problem. However, these technological advances are only a partial solution, asserts Ronald Hutchinson, vice-president of marketing and research for Alexandria, Ohio-based Computer Conversations, Inc.

As late as the mid-1980s, blind computer users primarily relied on a device called an opticon to translate images from the screen. A small box with a scanner, the opticon has 144 pins that arrange themselves into characters displayed on the screen. Users use their fingers to read these images much as they would Braille.

Hutchinson, a systems programmer, tried using an opticon after he lost his sight 11 years ago, but he found the device frustratingly slow. "It can only read about 40 words per minute," he explains.

Hutchinson also came across talking personal computers, but these machines cost \$6,000 or more. "It's a ridiculous price to pay for the product," he says.

Hutchinson's solution was to develop a program for his Tandy Corp. TRS-80 PC. Working with a voice synthesizer option such as Troy, Mich.-based Votrax International, Inc.'s Type 'N' Talk and Digital Equipment Corp.'s Dectalk, Hutchinson's software allowed the system to vocalize any text on the screen indicated by the computer's cursor.

Later Hutchinson developed a version for the IBM Personal Computer, PC XT and AT, PCjr or compatible running IBM PC-DOS or Microsoft Corp. MS-DOS and began marketing it. Known first as the PC Talking Program and the Enhanced PC Talking Program, the most recent version was renamed the Verbal Operating System in January 1986.

The product is compatible with 95% of the MS-DOS and PC-DOS applications on the market, he reports. Pricing for the Verbal Operating System begins at \$500.

Since Hutchinson developed his software, several other companies have introduced products that provide voice read-back. These offerings generally use some combination of software and speech board. A few provide large print displays for partially sighted users. Also, users can add modems or communications boards to connect to minicomputers or mainframes.

In addition to technical products, visually impaired people have turned to the 40-plus computer training programs for the physically disabled that have cropped up across the U.S. during the last 12 years. Many of the training centers that host special programs report job place-

ment rates of 90% or higher, according to Jim Vagnoni, chairman of the Association of Rehabilitation Programs in Data Processing (ARPDP), a national organization.

While they share similar success rates, the training centers' programs vary. The Berkeley, Calif.-based CIL Computer Training Program, which established the nation's first program in 1975, provides a nine-month course in programming. The curriculum includes Cobol, Basic, IBM 370 Assembler and RPG-II languages as well as courses in data base management and systems analysis and design.

At the end of formal class instruction, all graduates complete a nonpaid six-week internship at a company in which they are required to perform regular programming tasks such as designing, writing and testing programs.

The Center for Information Resources, another member of ARPDP directed by Vagnoni, also began DP training for disabled people in 1975. It provides two course tracks for students. One track offers traditional DP courses. Another focuses on end-user applications such as automated word processing, bookkeeping and accounting.

Along with the variation in computer training programs comes both criticism and praise. According to Hutchinson, special computer programs isolate blind computer users and make them dependent on the agencies that provide the programs. Despite his blindness, Hutchinson chose to take classes in several languages including Cobol, Fortran, PL/I and Basic at a local technical college. "The most successful people I know have gone through regular, integrated classes," he says.

At the same time, employers of visually impaired employees laud the training programs. "A computer training program graduate is real world business oriented and compares favorably with university-trained students," says Marshall Brown, senior project manager for Fireman's Fund Insurance Co. "They perform programming tasks above what is considered the norm for entry-level programmers," he says.

Mental prowess

Technology and training have helped blind computer users overcome many barriers, but they still face a major challenge — the perceptions of corporations. Many potential employers do not realize that physically disabled people can still think, Hutchinson says. "I, myself, have been turned down for a job because I couldn't see the screen," he says.

Nor is the problem limited to employers. Most vendors do not care about the visually impaired but they ought to, Hutchinson asserts. For example, Hutchinson claims, Microsoft has not been responsive to the needs of blind computer users with its introduction of graphics-based products such as Windows and OS/2, which is scheduled for delivery in 1988. "These products may completely close out blind people by preventing them from using voice synthesizers," he says.

"The barriers haven't gone away yet," Vagnoni agrees. "Most people have yet to learn to judge people on their abilities in the workplace rather than their physical disabilities." — RH

Cadre to declare support of EDIF

Move may signal connectivity rush among CASE products

Computer-aided design and manufacturing (CAD/CAM) may be about to merge with computer-aided software engineering (CASE). Noted CASE ware maker Cadre Technologies, Inc. in Providence, R.I., is expected to announce this month that it will support the Electronic Document Interchange Format (EDIF) protocol, already widely used to link disparate CAD/CAM products.

At the very least, this merger will mean that the rush to connectivity among CASE products will vastly accelerate. At the very most, it could mean that system developers will design their hardware and software at the same time, leading to a currently unheard-of efficiency of operation.

EDIF was developed for the convenience of CAD/CAM users. These users found they were using products from multiple vendors and, therefore, needed high levels of connectivity to exchange data between the various products. EDIF has emerged as the standard method of linking CAD/CAM systems to one another.

However, this is the first time EDIF has appeared in CASE even though the need for some kind of connectivity has been recognized for awhile. Indeed, if there is a common theme in the CASE world today, it is the development of products that cover the entire software development life cycle — ranging from analysis/specification to code maintenance (see story page 35). CASE vendors are either attempting to market products in each segment of the cycle or, like Index Technology Corp. in Cambridge, Mass., they are forging strategic alliances with vendors whose products are positioned elsewhere in the life cycle.

So far, however, Cadre has held itself aloof from the link wars. The company markets a CASE systems analyst tool called Teamwork. Based on various 32-bit workstations, this offering has become increasingly popular in scientific and tech-

nical installations.

As yet, and partly because it is based on technical workstations, Teamwork remains little used in the MIS community, which prefers to work with personal computer-based CASE systems. (However, this situation could change. The company has recently acquired the rights to a PC-based product.)

Now, however, Cadre has taken a radically new direction in connectivity. Rather than attempting to cover the cycle with its own products or set up strategic alliances with other vendors based on proprietary gateways, the company will support EDIF. Teamwork will be able to communicate freely with any standard CAD/CAM product.

If EDIF becomes a standard in the CASE world as well, MIS officers could find one of their greatest problems with CASE products solved. CASE's biggest drawback for MIS has been that various CASE products do not necessarily communicate with one another. If an MIS department buys an expensive system analysis device and a code generator, but one cannot mesh with the other, then the investment may not be worth the cost. But if each supports EDIF, and the system analysis diagrams can simply drop to the generator, then CASE could more than pay for itself.

More remote from MIS but still possible is that CAD/CAM and CASE could become one field. If developers are designing for software and hardware at the same time and using one and the same tools, then each could be uniquely customized for the other. Operating systems and certain applications could be made much faster and far less taxing on system resources.

Beyond that, the distinction between software and hardware could become fuzzy. It may be that developers in the future will regard the two as essentially the same. — MT

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Programming languages that meet MIS objectives

MIS managers in search of increased programmer productivity are turning to objective programming languages. These differ from standard-type languages in that they allow the developer to work in software objects — small, almost autonomous modules of code that can be used and reused in many different applications.

Objective programming thus eliminates the need to rewrite significant chunks of code for each new application. Object-oriented code is also easier to modify and maintain. Because the individual objects can almost be considered independent programs, it is possible to crash them individually but difficult to damage so many of them at once that an entire system will cease to function.

Several objective languages are on the market, such as Ada. Possibly the most popular of these languages are two versions of the C language. — Objective-C, from Sandy Hook, Conn.-based Productivity Products, Inc., and C++, which AT&T is promoting. Each has unique advantages.

C++ is second into the market but may be first in the hearts of programmers. Just ask Bruce Lynch, president of the Programmer's Shop in Hingham, Mass., a firm that specializes in tools for software development. He notes: "Objective-C is good, but C++ lets the programmer take a look inside [the individual modules of code] and see exactly what's going on at all times. Wrapping them up in a black box, the way that Objective-C does it, makes programmers very nervous."

MIS's requirements

However, MIS officers have somewhat different requirements. They may want to restrict the amount of time, money and effort that a programmer expends on the development of an application. For MIS managers, it may be that the more they can reduce programming to the reshuffling of black boxes, the better.

Objective-C has its fans, too. Users include Alen Schiller, chief scientist at Wild Lietz Canada Ltd., headquartered in Toronto. Schiller is currently at work on the company's System 9 project, a geographical information product.

System 9 will run on Sun Microsystems, Inc. workstations and provide users with an intelligent, interactive map. "If a local government wanted to know which of its taxpayers were in arrears," Schiller explains, "it could just do a query, and the addresses [of those taxpayers] would light up in red."

The product will be written mostly in Objective-C. "I got into objective coding because of my utter frustration trying to build systems in the traditional ways," Schiller says. "I kept working the old way, and I kept thinking how much easier it would be if we didn't have to rewrite so

much bloody code."

He says that Objective-C's two greatest advantages are the reusability of code plus its ability to withstand dramatic changes in internal structure. So, should Wild Lietz need to modify its code later — even if there are a large number of modifications — the company will be able to do so easily.

Another Objective-C user is Thomas Kraemer, research and development department manager for measurement systems software at Hewlett-Packard Co. in Palo Alto, Calif. "What we did with Objective-C was construct a signal analysis system that interfaced with a faceless instrument," Kraemer explains.

He says he chose Objective-C because "at the time — 1984 — we had done large projects in Pascal, but we realized we wanted to use some sophisticated programming concepts. We wanted to use a software 'cache,' for example, to enclose some data."

Both Schiller and Kraemer, however, say they have had problems with object-oriented programming in general. Schiller, for instance, notes that developers

must retrain programmers before they can use any objective programming language. "There is a learning curve; don't let anyone kid you about that," he says. "You have to be prepared to accept the decline in productivity [as] you're learning. But in the long run, it's worth it."

Kraemer, meanwhile, notes that no programming language, objective or otherwise, can really solve the problems of developers. "I've become painfully aware that the language wasn't our problem," he says. "If I were to do the project today, I would pay much more attention to management issues. I need some [product] to coordinate the efforts of more than two programmers at a time." — MT

Which way would you learn about text management?

On your own?

For years text management has hovered on the outer fringes of MIS consciousness.

Which is strange, considering how important it is to some of the key people MIS has to serve.

Like company attorneys faced with an unexpected lawsuit.

It's at times like these that text management software has proven its value in organizations all over the world—delivering benefits people didn't even know existed a short while ago, and creating a crescendo of demand at the very highest organizational levels.

What does this mean to you? Several things:

First, it means you'd better understand what text management is all about—before your users do. (Hint: If you're thinking "word processing," read on.)

Second, it means you'd better select a text management system with the features *users* need to obtain information—plus the features *you'll* need to maintain system integrity. Users need specialized text search and index facilities conventional DBMS's don't offer; you need database and system control facilities dedicated retrieval systems don't offer.

And third, it means you'd better start evaluating text management systems and vendors without delay. And there's no better way to begin that evaluation than by taking a close look at INQUIRE/Text—the most comprehensive, proven text management software system on the market.

Text management; it's not word processing. And it's not data management.

Traditional corporate information systems do a great job managing structured data. Unfortunately, the information most needed by decision-makers is often unstructured—embedded in the text of documents such as letters, memos, reports, contracts, and transcripts. Because this material has traditionally been beyond the reach of online systems, access to it has been slow, tedious, and error-prone. Word processors and other office automation systems have greatly accelerated document creation and distribution, but they are all but useless in making the actual information content of documents available as an online resource.

A text management system fills this need by providing highly sophisticated facilities for online index, search, and retrieval of information in stored documents. With a text management system, users at all organizational levels can pinpoint specific pieces of information within vast volumes of text—instantly. And once they've found the information, they can edit it, combine it, and report it out with complete flexibility.

Not surprisingly, the biggest text management system users have tended to be companies engaged in complex litigation or regulatory proceedings. But as text databases have proved their value in these initial applications, they have increasingly been used in others as well—from competitive intelligence gathering to online maintenance of technical documentation to a full array of corporate records management tasks. And as senior executives have become comfortable

with text management facilities, they have increasingly mandated their use throughout the organizations that report to them.

The results: a dramatic improvement in the overall quality of information available to decision-makers. And a dramatic increase in pressure on MIS to deliver top-flight text management capability.

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As the demand for text management capability has grown, so has the number of vendors claiming to provide it. But few of these vendors offer the features, the flexibility, and the track record of Infodata's INQUIRE/Text.

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INQUIRE/Text: It's the first thing you need to know about text management. ♦

Correction

The information for the chart on page 60 was provided by Nancy Dematteo of HSH, Inc. [CW Focus, June 3].

INQUIRE/Text runs on IBM and compatible mainframes under MVS/TSO, MVS/GICS and VM/CMS.

U.S. R&D consortia growing to counter foreign threat

The number of high-technology research and development consortia in the U.S. is climbing.

According to Ron Havelock, research professor at George Mason University in Fairfax, Va., roughly 55 U.S. R&D consortia have been formed since the passing of federal legislation on the subject last year. The law gave the green light for private companies to collaborate on mutually

beneficial R&D.

Havelock points to a number of reasons behind the recent loosening of antitrust laws. One factor is a 1986 reenactment and revision of the 1980 Stevenson-Wylder Act, which required every federal agency engaged in internal research and development to make its findings available to private enterprise.

"The act really let it be known that it

was all right for research entities to get together and share some knowledge," Havelock says. "The 1986 reenactment strengthened that original thrust."

Another plus was the formation, several years ago, of Austin, Texas-based Microelectronics & Computer Technology Corp. (MCC), a consortium of high-tech companies formed as a direct response to the threat posed by the Japanese and their government-supported Fifth-Generation Computer Systems project.

Havelock says that the perceived Japanese threat and, to a lesser extent, the threat of the Europeans, gave the Reagan administration the ammunition and incentive to change the antitrust laws.

Bruce Barnes, a director at the Soft-

ware Productivity Consortium (SPC), a group of 14 U.S. aerospace companies based in Reston, Va., acknowledges the Japanese threat as a motivating factor behind the formation of SPC and other consortia. Many of the consortia, in fact, do business with the U.S. military and have military backing.

"I think the U.S. military has been worried for a long time about falling behind other countries in technology," Barnes says. "The military's assistance with high-tech consortia comes from the same [military] pressure that created the Ada programming language and the Strategic Defense Initiative program."

Havelock says that U.S. consortia generally take on one of two forms. There are groups such as SPC and MCC that are composed of separate, private firms with a mandate of pooling R&D and producing technology primarily for their own use.

Havelock claims, however, that a more typical pattern involves the clustering of several private firms around a major U.S. university that coordinates much of the research activities and overall direction.

While a miniature floodgate has been opened for cooperative high-tech R&D in the U.S., Havelock is quick to caution against automatically assuming the success of such efforts.

"The Japanese and some European countries have a definite advantage in experience and long-term support of consortia," Havelock explains. "There is a tendency with U.S. consortia to have sponsors come in for short periods, a year or two, and to expect quick, hard results. They'll just have to be more patient."

Another disadvantage, Havelock says, is the inability for U.S. high-tech consortia to channel research and development products to the commercial area.

"The Japanese are great at carrying a concept right through to the commercial field," Havelock says. "But perhaps only the British are worse than Americans at marketing and targeting the end results of consortium research and development," he says.

'Still an alien idea'

"The concept of a consortium is still an alien idea here. U.S. companies have to overcome mutual suspicion and the tendency of U.S. managers to think that anything not produced in their companies is just not good. My concern is that these consortia will produce so-called gold-plated products that will be unnecessarily expensive for what they do and that will not be commercially competitive. That is the case with many U.S. defense contractors. Fortunately for them, they already have a built-in military and government market," Havelock explains.

The bright hope, he concludes, is that the members of fledgling U.S. consortia will get over their initial awkwardness and start flying.

"It will be an experimental period for these groups," according to Havelock. "I don't think the U.S. managerial style will be a stumbling block. Money is another thing. If the consortia can maintain long-term sponsorship, they could prove the concept really works in the U.S." —SK

News section compiled by *Computerworld Focus* staff members Stan Koldziej, Michael Tucker and Rebecca Hurst.

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Today's rising tide of litigation is placing extraordinary demands on corporate legal departments—forcing attorneys to prepare and manage cases of unprecedented volume, complexity, and public visibility.

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But attorneys aren't the only ones who benefit from INQUIRE/Text. The very features that make INQUIRE/Text so ideally suited for legal applications also serve the needs of other departments such as planning, marketing, regulatory affairs, the library—and not least of all, MIS itself. In fact, INQUIRE/Text is a perfect system for the online maintenance of a wide variety of technical documentation. With its large capacity and flexible database facilities (including automatic backup and recovery, usage monitoring and accounting, and multi-level security), INQUIRE/Text protects the organization's interests while serving the individual.

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Speaking of which: if you've read this far, you probably know as much about text management as your law department does. So if they start presenting a case for text management, you've already got a case to present in return. A case for INQUIRE/Text. ♦

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The art of directing talent

BY ROGER SOBKOWIAK

Every workday we are mindful of systems that fall short or fail completely because MIS managers and development teams spend too little time managing the human dimension of a system introduction. Although many in the computer world can articulate the principles of good people management, why is it that organizations don't seem to implement these ideas?

For some MIS managers, spending time on people issues seems like a waste of precious management time. Often there is a gap between what managers know and what they feel.

For every systems success story in the computer news media, there are dozens, perhaps hundreds, of untold tales of systems that don't meet expectations. In companies in which managers regard people and technology as equals in creating systems that work, the following operating rules prevail:

- **They conduct work by groups.** A lone eagle is the exception, not the rule. Even lone eagles can burn out. Working as a group does not come easily to a lot of people, particularly if a development team is being asked to factor in people issues for the first time. Initial efforts may be clumsy and unproductive because no one is sure what people issues really are. Nonetheless, shared expertise, shared perspectives and shared support enhance the odds of asking the right questions and implementing a successful system.

- **They have a master plan.** Successful companies form a master plan, show it once or twice, then put it away. Most people are not interested in abstractions like a changing company culture. Most people

focus best on the work closest at hand. Managers and development teams work best when they can see tangible improvements quickly. Aiming for small personal victories and being willing to make compromises are key.

- **They sell and market the need for a balanced equation of people and technology.** These companies let the people who have experienced a properly introduced system sell the merits of such a process. During and after a system introduction conducted with the proper attention to people issues, these companies ask for feedback and use that feedback to teach the next implementation team.

- **They create and use human resource tools and techniques.** Managers love tools. That's what made Kenneth Blanchard and Spencer Johnson's book, *The One Minute Manager*, a success. The authors repackaged existing management theories to make them more usable. Companies should utilize the fact that information systems professionals like rules and detailed lists and should give them the capability to deal more effectively with the human dimension of their work in the form of rules and guidelines.

- **They talk about all of these steps with the staff again and again.** Remember that getting the heart and the head working in synch takes time and practice. Companies that constantly reinforce the qualities that allow systems and people to work

Sobkowiak is a managing partner of New Haven, Conn.-based Software People Concepts, Inc., a consulting firm specializing in the management and human resource issues of MIS organizations.

LAURA TARRISH

together productively will shorten that time and practice period.

Now, think of four adjectives that you would use to describe an MIS manager you know. "Analytical," "thorough," "efficiency minded," "cautious" — did any of these qualities come to mind?

Now think about how the words you chose are reflected in the following list of reasons why

managers and development teams fail to factor the people component into systems introductions:

- It's not part of the company culture.
- We are not trained to deal with nontechnical issues.
- We see people issues as an extra duty.
- We delegate people issues

to someone else.

- The personnel department is not strong enough.
- We do not analyze past systems failures to understand how ignoring human resource issues contributed to the downfall.
- We feel powerless in the area of people issues. (The system is against us, anyway, even if we wanted to do more.)

• The number of people involved is too great to have time to be concerned.

- People issues will resolve themselves.
- Well-designed technology takes care of people issues.
- It's a government contract, and the government doesn't pay for time required to work on human resource issues.

Any combination of four or more of the aforementioned statements assures the failure of a system introduction. Each represents a method of thinking and operating that ensures that management will not identify and deal with human resource issues.

Now think about how this situation plays out in practice and its consequences to an organization. How many of the following situations have occurred in your company?

- The existence of dual systems. Computerized and the manual systems reside side by side. It has been two or more years since the introduction of the system, whose goal it was to provide paperless transactions, but professionals are still maintaining hard copies because they do not trust the system.

- Expensive equipment just sitting around. In your company, office automation means that support personnel are using \$10,000 machines at 20% of

Achieving a balance between people and technology solutions demands more than Band-Aid approaches such as lip service, a quick look or a simplistic training program.

their capability and their bosses don't use the machines in their offices at all. Your project is at least three years old, and top management is still puzzled by the absence of tangible productivity gains.

- The staff not using your artificial intelligence-based system because people feel a loss of power. The organization initially brought the system in as the MIS department's newest technology, and it was used to replicate the expertise of five senior transaction specialists. But now the system is in the hands of field agents who are reluctant to use it because they see it as a usurper of their skills.

Management must consider personnel parameters before, during and after the implementation of a technology. This consideration starts with the selection of an implementation team to ensure that members of the team are capable and willing to look at human resource questions. And, most importantly, the implementation team must have the power to do something about any problems. Achieving a balance between people and technology solutions demands more than Band-Aid approaches such as lip service, a quick look or a



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A company needed to transfer data between its New York and San Francisco data centers. They were looking for a tool to move all types of data, do it automatically and provide complete security and management control. Their goal was to operate the two data centers like a single facility.

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simplistic training program.

Management needs to make a commitment to the people resource in an organization. Mind-sets need to change. Ways of doing things differently include having human resource checkpoints built into a project development plan; inviting non-technologists to participate in the development team; and reviewing the development plan for process as well as content and asking how the development team is working.

In addition, other methods to keep a system implementation team on track include fixing the process of work before automating; using technology to reexamine tasks, roles and relationships; looking for necessary changes to practices, rules

and policies that aid technology usage; slowing down or stopping a system introduction if employee resistance has not been resolved; letting the end users own the system; spending a great deal of time on designing screens and sharpening documentation and instructions and spending less time on programming; and measuring how well the project is doing by how eager the most resistant system user becomes.

This set of commitments is difficult to make. The shame is that too few systems development teams will go through such an undertaking because of other, pressing demands. To counteract this tendency and get a jump in helping a development team consider people issues, MIS managers should try to do just three things.

First, because the recipients of a system are the best source for identifying human resource issues, ask these employees for their thoughts often and take their comments and suggestions to heart.

Second, managers should be willing to borrow from successes in other fields, showing the relevance and connection to your particular systems introduction. For example, the Quaker Oats, Inc. Gaines dog food plant in Topeka, Kan., is a heralded model of self-managed work groups that resolve a full range of sociotechnical issues. It is an exemplary model for self-managed project implementation teams that control new system introductions.

Finally, managers should keep in focus the technological mind, a mind that appre-

ciates structure, order, checklists, forms and models. They should use tools just like technologists do to enable activities to be carried out or reinforced.

Numerous tools that can accelerate and complement the introduction of productivity improvements by emphasizing people skills or identifying people issues are already available.

Computer-assisted performance and goal setting is an important key to blending technology and human resources. Setting and tracking performance goals is always a difficult process for most technical people. Providing an electronic platform for the process enables managers and employees to work at focusing on tasks and the skills necessary for carrying out the

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Make the human resource grade

The checklist below is a nonscientific, informative way to determine the amount of attention your organization gives to balancing systems development and implementation with human resource issues.

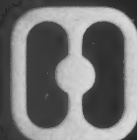
Give a value from 1 to 10 to the following questions. Responses should range from 1, representing "never occurs," to 5, representing "we talk about it, but the talk generally does not lead to action," to 10, representing "it happens all the time and we act upon it."

- People issues are built into our formal project review process.
 - There are nontechnical personnel working on our projects.
 - In a review after the project is completed, we consider the following: organization conflicts, the skill level of assigned personnel, management style, user attitudes, user skills and resistance to change.
 - The development team is required to construct a plan to eliminate or minimize all identified or anticipated people issues.
 - During the specification phase of a project, we look at the people considerations that will assure successful implementation.
 - Our MIS people receive training in nontechnical skills such as team building, negotiation, collaboration, listening and consulting.
 - End users are asked to identify all people issues and people-system conflicts that they foresee.
 - New MIS hires more often come from the user community and are taught computer skills.
 - In judging the overall success of a project, we take an accurate picture of how people feel about the system.
 - In piloting a system, we pay special attention to the rules, policies programs and procedures that support or hinder the introduction of a system.
- Now total up your score.
- 80-100** — Your organization is providing the right emphasis on human resource issues.
 - 50-80** — Your company is on the right track.
 - 30-50** — Better start reading some books.
 - 30 or less** — A good number of systems in your organization probably are or will be failures. — ROGER SOBOKWIAK

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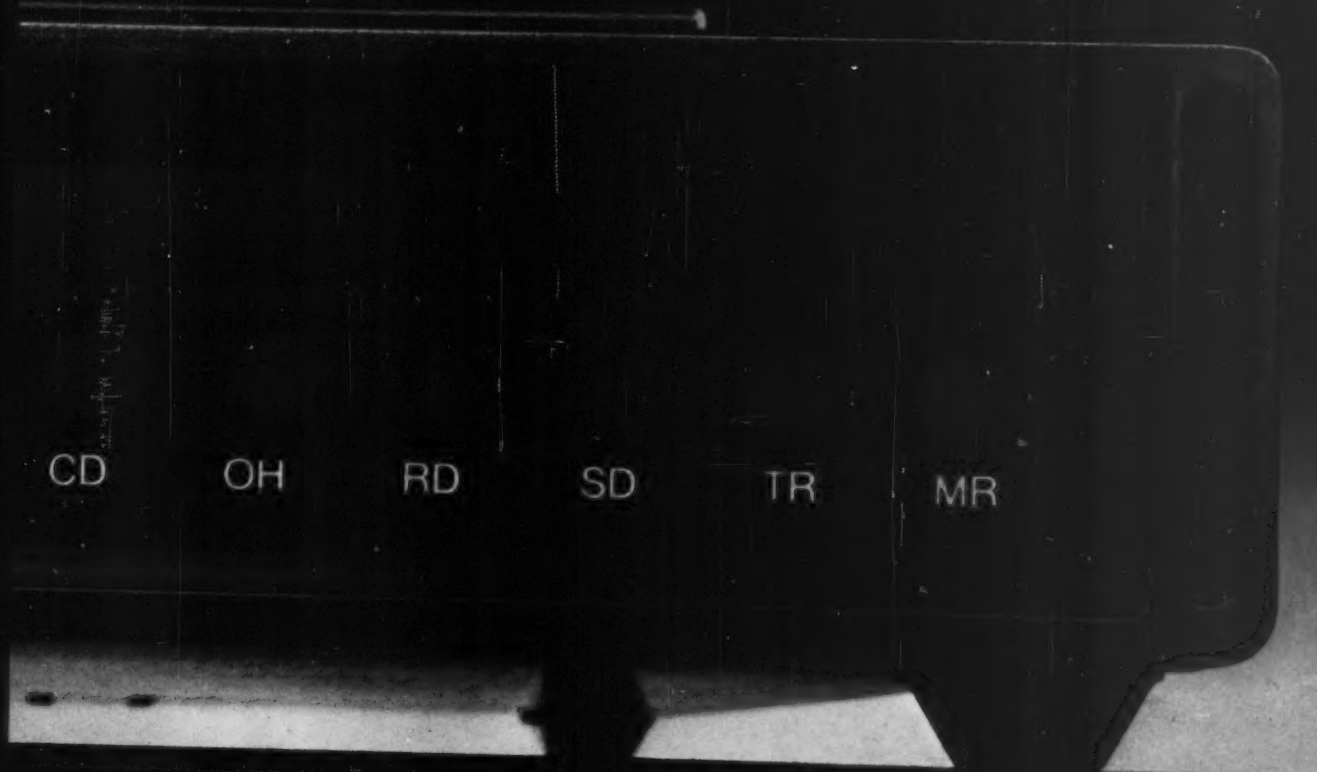
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HUMAN RESOURCE MANAGEMENT

tasks. No one gets bogged down in paperwork. And most importantly, profiles built into the package can emphasize the people skills dimensions of a job.

Joint application development is a process for improving the initial and ongoing communication between a development team and end users. It accelerates the flow of critical data at various

stages in a project life cycle and makes sure that those involved address key issues. People considerations can be embedded into the process.

On a project there is frequently a need for a humanistic scan team, a group of nontechnicians who audit and assist the work of the development team by assisting with screen designs,

documentation and team interfaces with clients. They also catalog the nontechnical reasons for systems working or not working.

Organizational mapping consists of using a computer to provide insights on how best to organize the MIS organization, eliminate redundancy and provide a proper focus. It helps to clarify roles and tasks and to deal

with organizational boundaries. This type of mapping can be a process for charting how people issues surface and are resolved between the MIS organization and other organizations.

Competency tracking, or identifying the knowledge, skills and behaviors required for superior performance, is another way management can bridge the gap

between man and machine resources. It is a powerful method for highlighting and profiling the nontechnical skills and behaviors required to do a job. With individual profiles and self-assessment capabilities, development team members come to a clearer realization of what is required of them when they are creating and introducing a system.

Computerized skills inventory systems capture data by job history, project involvement or tasks.

These systems emphasize the skills that are important to an MIS organization and provide highly visible benchmarks for all MIS professionals. By tracking the skills developed by team members during the handling of a specific project, the skills inventory system reinforces the management requirement to address people issues.

Computer-generated career mapping is a way for individuals to ask the company what they can expect in terms of career growth and what the company expects of them in terms of skills and knowledge to make successful career moves. The more that career options emphasize people skills, the better.

Profound impact

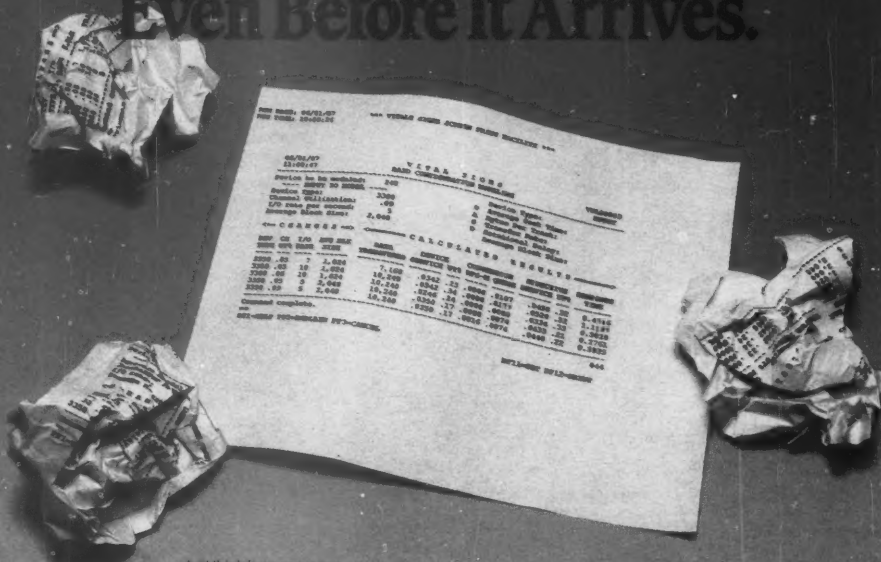
When these tools and techniques are used singly or in various combinations, the impact on the MIS organization and the subsequent impact on MIS projects is profound. Cultivating these methods takes time, however, and merely using a tool once will never produce rapid turnarounds.

Environmental factors, company culture and entrenched management attitudes are powerful forces with which to do battle, and one tool alone will not save the day.

It is important that a manager recognize that sound tools and techniques enable an MIS organization to focus on what it takes to get a system up and running successfully. However, a single, enlightened manager is not enough to shift an organization's ingrained emphasis on technology solutions over to balanced solutions that take into account both people and technology. For an MIS organization to function in a more balanced way requires different thinking, significantly different skills and the discipline to stay on track and committed.

Little successes can lead to large successes if people understand, publicize and learn from these accomplishments. Technologists diagnose systems all the time for things technical, trying to understand why they failed. Organizations must train these same talented and inquisitive minds to utilize their diagnostics skills to recognize how failing to deal with people issues inevitably leads to diminished systems performance. ♦

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OS/2: Have we seen the future?

BY BRIAN JEFFERY

Choosing to buy into IBM's Personal System/2 line is not merely a decision of hardware and software. It is a choice to follow IBM's connectivity philosophy for the future. IBM's announcements may force MIS managers to rethink the direction computing will take in their organizations during the next 20 years.

IBM's OS/2 environment introduced for its PS/2 line is part of a broader IBM software scenario that includes applications on hosts and mid-range systems and IBM System Application Architecture.

OS/2 was designed as the workstation-level component of this scheme, with IBM's data base management, communications and end-user interface features reflected in offerings throughout the firm's product line.

IBM's OS/2 Standard Edition costs \$325; the Extended Edition, when it is available, will reportedly cost \$795. The difference in price between the Standard Edition, which does not have many of the data base management, communications and end-user interface features, and the Extended Edition, which contains all of them, is only \$470. However, the two editions present different conceptions of personal computing as well as varying levels of commitment to the full IBM scenario.

IBM's PS/2 line is not just a personal computer, and OS/2 is not just a personal computer operating system. Granted, these products provide multitasking, Intel Corp. 80286 protected

mode, windows, high-resolution graphics and numerous other PC features, but IBM designed this principle PC product line to form an integral part of the firm's broader product scenario.

The extent to which the OS/2 operating environment is integrated into the full IBM scenario is striking. In particular, OS/2 Extended Edition, as a set of bundled capabilities, does not suppose a user may want to pick and choose his features; for the extra \$470, you get connectivity to virtually the entire IBM product line, a commitment to an SQL-based relational data base management system (DBMS) and the core of an end-user interface that will ultimately provide transparent access to every facility of every system in an IBM network. It is rather like a workstation integration Solutionpac, a comprehensive set of "load-and-go" features.

IBM obviously put a lot of planning into its latest move, whose origins can be traced to 1983, when IBM started putting together a global software-infrastructure designed to form the

core of its large end-user solutions well into the 21st century. Some of these capabilities have been implemented, some are due soon and some are still in IBM programming laboratories.

These capabilities include a complex of relational DBMS reflected in OS/2 Extended Edition's Database Manager; a multifunctional communications environment reflected in OS/2 Extended Edition's Communications Manager; and a common end-user interface implemented in OS/2 under its Presentation Manager component. The whole of these capabilities will ultimately serve as the vehicle through which a user may access the full range of facilities available on all IBM systems in an IBM complex network.

The Database Manager is a crucial component in OS/2 because mechanisms have to be established to manage, manipulate and store the large data volumes that will be generated in an IBM complex network. The data base components of this scenario have been progressively fleshed out since 1983, when DB2 debuted. DB2 was introduced as a high-end relational solution aimed at the central host MVS/XA environment and was progressively enhanced to provide features and functions with



RALPH MASELLO

Jeffery is managing director of International Technology Group in Los Altos, Calif., an industry research firm.

PRODUCT ANALYSIS

each release.

Then, IBM's SQL/DS, which was originally introduced in 1979, began to move into the forefront last year, when it was presented as the principal relational DBMS solution for the 9370, tightly coupled with the VM/Transparent Services Access Facility environment on the system. Remote Relational Access Support provided transparency for users to IBM relational systems regardless of the hardware on which they resided.

During 1986 and 1987, DB2 and SQL/DS acquired a series of front ends, facilitating user access to the IBM relational environment.

IBM next introduced Enhanced Connectivity Facilities (ECF), a set of transformation standards initially implemented to provide connectivity between IBM and third-party PC environments, such as Lotus Development Corp. 1-2-3 and Symphony, Ashton-Tate Dbase and Microsoft Corp. Multiplan, to allow data transfers between PCs and IBM relational DBMS. Lotus, Ashton-Tate, Microsoft and other PC software companies that had been let in the plan hurried to support ECF, add SQL support and otherwise ensure that their products would fit the scenario.

In April, the finishing touches were put to the workstation level of IBM's grand plan with the announcement of OS/2 Extended Edition, which includes a built-in SQL data management function and ECF support. The result is the creation of a multi-level relational DBMS structure with system-transparent user access, support for most key PC software environments and the ability to file and access SQL-format data anywhere within an IBM complex network.

Communications abilities

IBM's communications environments have become complex in recent years as the company inserted new systems and applications into an increasingly heterogeneous Systems Network Architecture (SNA) line-up.

Peer-to-peer networking was introduced through LU6.2. ECF and its Server-Requester Program Interface provided an infrastructure for PC-to-mainframe communications oriented toward relational DBMS applications but at first were not implemented supporting LU6.2.

Netbios and the IBM Token-Ring local-area network (LAN) provided new LAN interfaces. Multiple data streams, ASCII and X.25 support and several species of 3270 emulation added to the increasingly complicated picture. IBM built a spider's web of connectivity across diverse and often incompatible systems.

The problem of implementing these various communications features has been quite impres-

sively resolved by rolling almost everything into the Communications Manager component of the OS/2 Extended Edition.

Included in the Extended Edition are support for LU6.2, ECF, conventional SNA 3270 communications, Netbios and 802.2 LAN interfaces, ASCII communications, several species of file transfer protocols, ASCII and 3270 terminal emulation and some substantial built-in communications management functions. IBM has indicated plans to further support full High-Level Data Link Control and X.25 connectivity, 5250 support for at-

color graphics world and interesting things happen with scanner images. These images can be entered through IBM scanners via PCs or high-end 3270 terminals, can be stored in IBM host data bases, can be merged with GDDM graphics and Professional Office System (Profs) text material and can be variously manipulated at an OS/2 workstation.

By now, we are getting close to the Big Blue concept of the Compound Electronic Document (CED). This futuristic concept enables end users to create, edit, store, communicate, receive and

electronic documents.

All the talk about integration brings us inevitably to System Application Architecture (SAA), IBM's global scheme for system integration. IBM describes the PS/2 and its software components as the first full SAA system. (This description is not strictly accurate — the 9370 was actually the first SAA implementation.)

Big Blue has also indicated that all its systems introductions from now on will have a comparable level of SAA conformance. This step suggests that some major introductions written to SAA standards will be forthcoming for MVS software applications and the 9370 VM environment. It also suggests that IBM's new combined System/36 and 38 machine — referred to as "Silverlake" — will have a comparable level of SAA implementation, which in turn suggests that IBM might be a little further along with the SAA process than has appeared to be the case to date.

IBM describes SAA as consisting of four main elements:

- **Common User Access** to the full range of IBM systems via a common menu-based end-user interface.

- **Common Programming Interface** to support Cobol, Fortran, C, a Cross System Product-based application generator, a Rexx-based procedure language, an SQL-based data base interface, a Query Management Facility-based query interface, a GDDM-based presentation interface and an ISPF-based dialogue interface.

- **Common Communications Support** to include 3270 Data Stream, Intelligent Printer Data Stream, Document Interchange Architecture/Document Content Architecture, Systems Network Architecture Distributed Services, Netview, LU6.2, Low-Entry Networking, X.25, Synchronous Data Link Control and the Token-Ring.

- **A set of common applications** based on the above and initially focusing on VM-based office software.

The principle is simple: IBM wants to create a common user environment in which access to systems for business applications and programming can be performed regardless of the actual IBM hardware and software that the user is utilizing.

Behind the interface, a mass of interlinked software applications written to SAA standards handles all of the jobs generated at the interface and looks after connectivity between the various IBM environments. Probably the best analogy for IBM's setup is of an intricate Swiss clock. The clock's machinery consists of a mass of whirling cogs, interlocking wheels, clanking gears and swinging pendulums. However, all the observer

sees is the clock face, which gives him what he needs — the time.

Integrating all these components is going to require a software infrastructure of awesome size and complexity. IBM has already said it will look after its end of this job by implementing SAA conformance on its key software offerings and publishing the specifications that third parties and end users will need to structure their own programming activities. Although it is less emphasized, IBM also will assume responsibility for implanting the SAA end-user interface in the PC base.

IBM is, however, clearly taking no chances and is progressively bringing all of the major PC applications vendors onto the bandwagon. Microsoft and Lotus have already signed joint development agreements with IBM to develop applications that will conform with SAA.

More than meets the eye

There is, then, a great deal more to OS/2 than meets the eye. It is the lowest tier of an IBM effort to create a series of more or less packaged, internally compatible software environments at multiple levels. The functions available in a PC-based workstation are mirrored in those available in a mid-range system, a host system and other network components.

The connectivity, once the pieces come together, is automatic, and a mass of different systems become part of one gargantuan set of facilities available to the PC user. A few keystrokes may invoke an application on a 3090 located in Singapore with the same ease as a 1-2-3 file on a local floppy disk.

This connectivity and integration makes the PS/2 one of the most important product lines in IBM's history. Depending on how one feels about IBM's overall scenario, the OS/2 and PS/2 are either the company's most attractive products in a long time or a Pandora's box that will in a few years have the entire organization overrun with CEDs, 9370s and a software overhead of cataclysmic proportions.

Either way, the process may be a little hard to control in that IBM has thoughtfully built all of the required hardware features into the PS/2 motherboard and has packaged all of the required software functionality into OS/2 Extended Edition. Once a company loads OS/2 at the workstation level, integration into this IBM plan could be difficult to resist as PC users realize what they can do with the product.

It might be worth thinking about that \$470 price difference between OS/2 Standard Edition and OS/2 Extended Edition. Paying it or not paying it may turn out to be an important decision indeed. ♦

Depending on how one feels about IBM's overall scenario, the OS/2 and PS/2 are either the company's most attractive products in a long time or a Pandora's box.

tachment to System/36 and 38 systems and other features.

Combined, these features should turn OS/2 Extended Edition into an all-purpose communications package providing modular connectivity to IBM hosts, mid-range systems, LANs and various network offerings.

The end-user interface in OS/2 is based on Microsoft Windows. The interface is implemented in OS/2 Standard Edition as the Presentation Manager, with baseline windowing, pointing device and all-points-addressable graphics.

In OS/2 Extended Edition, support is provided for full Video Graphics Array (VGA) with high-resolution color graphics and scanner image support, interfaces to the IBM host Graphical Data Display Manager (GDDM) color graphics environment and Distributed Function Terminal (DFT) mode.

DFT mode is one of the more interesting pieces of the jigsaw. It is an implementation of SNA microcode that permits a single physical device to appear to another IBM system as multiple logical devices. In its workstation application, IBM has translated the DFT mode into the ability to support up to four simultaneous, user-adjustable screen windows reflecting sessions with up to four different IBM systems.

In OS/2, IBM has implemented the DFT mode capability as an overlay to the basic Microsoft Windows concept. A window, whether to a local PC session or to a system elsewhere in an SNA network, looks much the same to the end user, and PC windowing merges gently into SNA sessions.

Through this merged interface, the VGA graphics environment, which is compatible with the first-generation IBM monochrome, color and Enhanced Graphics Adapter standards, similarly merges into the GDDM

play back fully integrated documents incorporating data, text, graphics, image, voice and non-coded or scratch-mark information. As presented by IBM, CED manipulation would include routine data, text and graphics components with some new twists.

The first component of CED is image processing in the form of scanner-inputted material. This material could be expected to consist principally of paper documents that have been entered into an IBM data base and then called up by the workstation user to incorporate a copy of one or more images into a compound document.

The second component is scratch-mark data manipulation. This element allows the possibility of being able to electronically sign a document with a light pen or comparable pointing device, thereby removing the necessity for a separate hard copy of a document in applications in which a personal signature is required.

Thirdly, CED would include voice in the form of a voice-over to a document that could be played back by a recipient as he reviewed the document.

Voice, in this case, is supplied by the overlooked Rolm Corp. Rolmphone 244PC or similar product. The Rolmphone 244PC, announced by IBM at the same time as the PS/2, is a combined voice/data interface to PCs. Currently offered only for Rolm CBX attachment, the product could signal the beginning of a more sophisticated level of PS/2-compatible voice support.

The CED concept will get closer to becoming a reality with IBM announcements later this year, although it will probably be a few years before CED is feasible. Certainly, the concept will blossom during the life cycle of the PS/2 — that is what the PS/2's 3363 internal optical drive is for. The 3363 built into the PS/2 will provide a means for storing and accessing compact

CASE systems near fruition

BY REBECCA HURST

Hallelujah! Computer-aided software engineering (CASE) has arrived offering salvation from tedious manual logic design, hand coding and software applications backlogs.

Or has it? Skeptics point out that full CASE products do not yet exist. True, CASE supporters say. However, successful users of current CASE products recite miraculous

productivity leaps. Fully developed systems, they claim, will only improve those gains. The problem is that these productivity claims mean different things to different users because the CASE products available today address various aspects of software engineering automation. The challenge for MIS managers is to identify the type of products that will best meet their needs.

CASE systems can be broken down into three basic groups: those that focus on schematic design at the front end, code generators that help programmers at the back end and overall systems that take the programmer from start to finish. Schematic design and code-generation products are available today. Complete systems are expected to begin appearing by the end of this year.

Schematic design products, which generally run on personal computers or workstations, consist of two-dimensional languages, according to George Schussel, president of Andover, Mass.-based Digital Consulting, Inc. These languages help the programmer describe a problem and provide a model based on data flow or processes, he says. Such products include Information Engineering Workbench (IEW) from Atlanta-based Knowledgeware, Inc., Case 2000 Designaid from Nastec Corp. in Southfield, Mich., and Exceleator from Index Technology Corp., located in Cambridge, Mass.

Hurst is a *Computerworld Focus* senior writer.

Until 1½ years ago, schematic design products, often known as analyst workbenches or tool kits, only assisted the programmer in producing specifications and documentation, says Carma McClure, vice-president of research for Extended Intelligence, Inc., a Chicago-based consulting firm. However, she notes, vendors have added more capabilities to these products as they realized the importance of solving critical problems at the beginning of the application life cycle.

To provide effective modeling, front-end schematic design systems need several components, McClure asserts. These elements include diagramming and graphics capabilities, tools to support prototyping, a design dictionary and analysis capabilities for error checking. The analysis functions, which are just appearing in schematic design products, are very powerful, McClure notes. "They're very important for productivity."

A primary advantage of a schematic design system is that "it gives programmers a metaphor for thinking about the systems they design," Schussel claims. The design system also provides consistent applications development. "A graphical design system takes the programmer through the development cycle step by step," he explains. The result is a set of standardized applications that can be more easily maintained and updated.

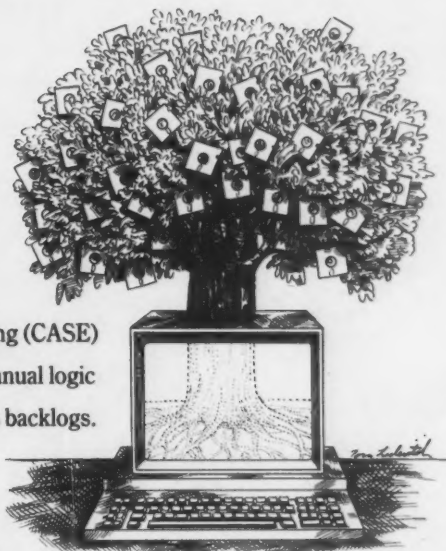
Two other advantages schematic design systems bring to applications are faster develop-

ment and better quality, according to Dwight Muller, director of computing services for Storage Technology Corp., a Louisville, Colo.-based mainframe storage manufacturer. Storage Technology brought in Auto-Mate Plus, a PC-based graphics design tool from Westwood, Mass.-based Cullinet Software, Inc., to reduce its applications development cycle.

While Storage Technology has not made an attempt to measure quantifiable differences in the cycle time using Auto-Mate Plus, Muller has seen instances of dramatic time savings. One example is the Cullinet IDMS data base application, which Storage Technology uses for tracking spare parts at all its field sites, nationally and internationally. "My staff was able to normalize the data base in 2½ to three hours," Muller reports. "Usually, it takes two to three weeks."

More importantly, Muller says, Auto-Mate has helped improve the design and analysis stage of applications development by bringing programmers and users closer. The schematic design tool allows programmers to put up a diagram so users can visualize the logic and data flows, Muller explains. "If users don't want what they see, it's easier to change." Additionally, the product's methodology helps programmers come to decisions faster. "It takes less time for our staff to provide users with a workable design," he comments.

At the back end are software products that automatically convert software logic designs into actual program code. While these back-end



TOM LULEWITCH

CASE EVALUATION

systems are known as code generators, to be viable they should do more than create lines of code, according to Extended Intelligence's McClure. They also need to provide automatic documentation, analysis capabilities for error checking and a data dictionary or central repository.

Some code generators include Gamma from Knowledgeware, Transform from Scottsdale, Ariz.-based Transform Logic Corp. and VAX Cobol Generator from Maynard, Mass.-based Digital Equipment Corp.

Code generators offer advantages for developing commercial applications that handle screens and data base access, according to Digital Consulting's Schussel. "It's enormously more efficient to have

computers write the code rather than relying on programmers," he asserts. Speeding up the coding process is the most important function of the generators, agrees Yancey Myres, manager of data processing systems and procedures

Only 2% of potential users have bought into CASE.

CARMA MCCLURE
EXTENDED INTELLIGENCE, INC.

for Riley-Beard, Inc., a Shreveport, La.-based subsidiary of the Ashland Oil Co.

Riley-Beard has been using DEC's VAX Cobol Generator to help update and convert its older software programs. The

company also wanted to make its code more consistent. "We wanted a code generator that would standardize our code so anyone who used the product would produce the same code," he says. "This consistency will make it easier for us to provide further software maintenance."

Despite the advantages code generators offer, Schussel maintains that the greatest benefit comes from having a generator integrated with a central repository. "A generator can quickly produce some 100,000 lines of code," he says. However, a central repository allows the generator to reuse portions of code that have been created, reducing the number of lines that have to be coded from scratch.

The distinctions between schematic design systems and code generators and the advantages they offer appear to be distinct. In reality, though, the approach of complete CASE systems has muddled the market as CASE vendors attempt to extend their products into this arena. Some products are closer to providing full systems than others, Schussel says. He predicts that a few may even have full CASE systems by year's end.

However, until then, users can expect to face the same confusion that has marked CASE products for more than a year. "It's difficult to see what products have and what the vendors have in development," McClure says. A result of this confusion is that only 2% of potential users have bought into CASE, according to McClure. Moreover, she predicts, until products actually have both front and back ends, many users will not consider CASE a bona fide strategy.

To understand where CASE vendors stand in providing a complete solution, users need to know the basic components of a full CASE system. One set of criteria developed by Schussel lists five essential pieces, as follows:

- At the front end should be software that can pictorially represent various aspects of the applications cycle.
 - Prototyping software should make use of graphics capabilities. "Prototyping allows the CASE system to automatically generate screens, a simple data base or a model of the system," Schussel says.
 - A dictionary, encyclopedia or repository should be the center of a CASE system. These terms and their variations are synonymous, according to Schussel.
 - A code generator should reside at the back end. At the mainframe level, this code is often Cobol. However, vendors provide other types of code such as DEC VAX assembly language.
 - A methodology or engineering approach should tie the CASE system together. This methodology can reflect any number of logical design approaches to software design including such widely used methodologies as Gain-Yourdan, Warnier-Orr and Chen Entity Relationship, Schussel says.
- Vendors planning to provide all these components include Knowledgeware and Nastec, working from the schematic design end, and Cortex Corp. and CGI Systems, Inc., working from the code generator end.

Two components currently missing in Knowledgeware's IEW product are a fully developed central repository and a code generator. Knowledgeware is reportedly enhancing its current repository. Rather than create a generator, though, the company is expected to build an interface between IEW and the Gamma code generator originally from Tarkenton Software, a firm Knowledgeware recently acquired.

Nastec's current implementation of Case 2000 Designaid supports strategic analysis and design. A beta-test version also provides real-time modeling, according to Albert Conner, vice-president of strategic business development for Nastec. Like Knowledgeware's IEW, Designaid requires a code generator. However, Nastec plans to use interfaces even more extensively to provide its CASE system solution.

First, Nastec plans to interface Designaid to several mainframe Cobol generators. The first of these will be Telson from Oakbrook, Ill.-based Pansophic



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CASE EVALUATION

Software, Inc. In addition to this basic CASE system requirement, Nastec plans to enhance its product through added features. To provide electronic publishing features, the firm is interfacing Case 2000 to Xerox Corp.'s Xerox Ventura Publisher. This product is in beta test. Nastec also plans to offer an interface to a simulation application. While the company is talking with vendors and universities, it has not announced any pacts.

Waltham, Mass.-based Cortex and CGI Systems in Pearl River, N.Y., take the opposite approach. The two companies each started with code generators, and they now have all but one of the CASE system pieces in place. They both need to introduce graphics-based front ends, and they both plan to address this need by developing their own offerings.

Cortex currently offers the Application Factory, which generates VAX language code and documentation. The product also includes tools for analysis and design and a central repository. In late 1986, Cortex announced Corvison, a graphics front end that would make the Application Factory a complete CASE system. The firm hopes to make Corvison available by late 1987/early 1988.

CGI's Pacbase is a Cobol generator that also provides schematic design and analysis and a central data dictionary. CGI has added project management tools to help guide the management as well as development of the application cycle. The company has announced that it is developing a graphics front end. "CGI's Pacbase is probably the closest to a true CASE system," Schussel says.

Code generator-based products such as the Application Factory and Pacbase may be powerful, but they are not for everybody. In fact, both Cortex and CGI state that they have turned down potential customers. "Some organizations are not ready for CASE technology," asserts Michael Blechar, CGI's director of corporate technical services. Managers who simply want to generate third-generation language code faster should use a straight code generator, he suggests.

'Not a short-term fix'

The key difference between simple generators and products such as those from CGI and Cortex is commitment, vendors and users agree. "This is a long-term investment," says Jaime Zapata, applications development officer for AIG-Data Center, Inc.'s Domestic Brokerage Division in Manchester, N.H. "This is not a short-term fix." DP departments using Pacbase can expect productivity drops on their first project, according to Zapata, who heads a Pacbase users group. "The payoff comes with the second, third, fourth projects and so on."

Products such as the Application Factory and Pacbase are synergistic, Schussel explains. The greatest benefit from these tools comes when a repository contains data systems of related information in the company that the CASE product can build on, he states. In addition, programmers have to learn to use the schematic design tools and methodologies of these generator-based systems, adding to the up-front investment companies have to make before they see any results.

For that matter, without a commitment to a methodology and training, no CASE tools will work to their full potential, according to Extended Intelligence's McClure. Methodology is particularly im-

portant. "From case studies, we've seen that the people with the biggest CASE productivity gains are those who already have a methodology in place and a commitment from management to support it," McClure says. Successful companies also select tools that complement their methodology and put those tools in the hands of their most skilled programmers.

Because methodology is so important, managers should choose a CASE product that supports the design approach favored by the company, Schussel recommends. MIS departments without a methodology may prefer to choose a product with an embedded methodology, he adds.

The textile fibers department of Du Pont Co., based in Wilmington, Del., uses

Cortex's Application Factory because the product follows a prototyping-oriented methodology similar to that already adopted by the department, reports Daniel Baetzel, quality manager for the textile division's Information Engineering Associates business center. During the past two years, productivity gains have ranged from 4:1 to 10:1, he reports.

Racing the brain

However, Baetzel notes, at anything more than a 4:1 development rate, applications are developed faster than a user can learn to use them. The problem, he says, is that users are not accustomed to having full-function applications developed so quickly. He expects that this

problem will disappear as users become involved in the development process so that they need less formal training.

Working with users relates to another methodology that managers must incorporate, Baetzel claims. Beyond a system for design, he explains, a company must also have a system of management.

"Most CASE tools don't support the need for human interaction," he says. "The danger is mistaking the design methodology for one of management." To get true benefits from CASE technology, managers must develop a system for getting users involved in the design of the applications they use. "Then you'll not only provide solutions faster, you'll be solving the right problem." ♦

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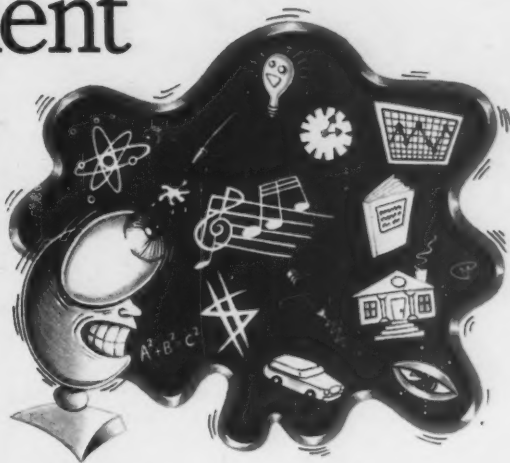
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Circle Reader Service Number 24

User interface management systems

Industry's best kept productivity secret

BY STAN KOLODZIEJ



If you think software has settled into a sort of sameness, user interface management systems (UIMS) just might be the tonic that refreshes.

To those working in the field, UIMS represent a revolution in software equal to the recent impact of data base management systems and structured programming.

Don't go looking for UIMS stories splashed across the trade press, however. To date, UIMS have been a candidate for one of the best kept trade secrets. But in another year or so, adherents expect UIMS to come

roaring into the business world.

"UIMS will make fundamental changes in the next decade in the way many systems get built," concludes Ben Shneiderman, an associate professor of computer science at the University of Maryland at College Park and author of a book on UIMS. "I believe UIMS provide a large increase in the magnitude of productivity in people who build user interfaces. I'm a great devotee of the concept," he says.

The UIMS concept has been studied and fine-tuned in U.S. university research labs for nearly a decade. From there, UIMS concepts filtered into private industry with companies such as Boeing Co., TRW, Inc. and Computervision Corp. developing in-house UIMS software for their own use.

Only in the past year, however, have UIMS found their way into the commercial market and into public view.

In 1986, Chelmsford, Mass.-based Apollo Computer, Inc. came out with Domain/Dialogue, thought to be the first commercial UIMS product. In the period since, Domain/Dialogue has become one of the company's best selling

software products. Following Apollo, a small spate of companies, most notably Precision Visuals, Inc. in Boulder, Colo., and the Template division of San Diego-based Megatek Corp., have tendered their own UIMS systems.

This showing is more a trickle than a flooding of the market, however.

"These systems are very much at the start of the product life cycle curve, in the sense that a lot of people don't even know they exist," explains Jim Foley, a professor in the department of electrical engineering and computer science at George Washington University in Washington, D.C.

Why should MIS get excited? Because UIMS promises to increase user and programmer productivity dramatically.

"The principle of UIMS is to customize and standardize the way users interface with a computer system," explains Kathleen Potosnak, a senior consultant with the Koffler Group, headquartered in Santa Monica, Calif.

"UIMS provide the tools for the user to develop these interfaces. Once the interface is done, it's also standardized in the sense that the user can utilize that particular interface for each application without having to keep learning new

interface procedures. This [capability] makes the learning process and the transfer of learning much easier. If someone gets transferred to another part of the company, for example, and has to use a new system, the interface will look and behave the same," Potosnak explains.

UIMS workers agree that there are certain key distinguishing elements found in most UIMS. Foley says one prerequisite is that a UIMS should be able to control program sequencing so that if a user enters a command, the UIMS invokes an action or subroutine that does some work. "From there, the control comes back to the UIMS, and the user can specify another command," Foley says.

Foley adds that another key UIMS element is a capability for the UIMS to organize visual representation for screen layouts.

"The UIMS will often have the capability to interactively lay out the screens or interactively design icons or menus," Foley explains. "If not interactively, then the UIMS will at least enable the user to build text files that have menu, screen layout and Help definitions. The UIMS often has some embedded Help capability because the system knows where a user is in a sequence of possible activities. If the user asks for

Kolodziej is *Computerworld Focus's* senior editor.

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help, the UIMS can arrange to give some context-sensitive help based on where the user is in the syntax parsing stage," Foley says.

The close connection between visual input and UIMS is no accident. Most of the companies that have entered the UIMS market with products have graphics and computer-aided design (CAD) backgrounds.

"The graphics components of UIMS vary, with pop-up and pull-down menus, electronic menus and full screen-oriented manipulations that you typically do with mice, light pens and data tablets," Foley says. "What's happening now is that as high-quality Macintosh-style, CAD-style interfaces get to be more common, the graphics approach [in user interface systems] becomes more important."

Jay Wiley, advanced technology manager at Bechtel Western Power Corp. in Norwalk, Calif., and a user of Precision Visuals' Enter/Act UIMS, says the company chose Enter/Act primarily for its graphics capabilities following an expensive and, ultimately, aborted attempt to build its own user interface system.

"Over time, we had built a number of computer systems, and the user interface was always a critical and very expensive component," Wiley says. "We finally got a major manpower scheduling system together that everyone said was nice and easy to use. Unfortunately, it took six people six months to build the interface, and by the time it was finished, the need for the software had disappeared."

Wiley says that before landing on Enter/Act, he had looked at other interface building options such as fourth-generation languages.

"There are a lot of fourth-generation tools, which do menus and forms, that we use in our data base applications, but our engineering systems require good, quality graphics that are critical to engineering analysis and interpretation," Wiley adds. "Enter/Act gives us forms management, and its menuing system also allows us to put graphics into a windowing format using our existing software. We immediately saw a way to leverage and get more out of our existing system."

The windows connection

The growing numbers of graphics-based software windowing systems now on the market are important precursors and adjuncts to UIMS, according to Gilbert Cardwell, a director of engineering at Precision Visuals.

Cardwell says that any application constructed to run in a windowing system includes two elements that are fundamental to the UIMS concept: reusable code that is shared or reused by a number of applications; and inde-

pendent code modules that are separated from and independent of the code that performs the actual work of the application.

"This separation of code from the application is what gives application developers more flexibility in data entry," explains Lois Framm, a technical specialist at Bell Communications Research Corp. in Morristown, N.J. "It's fantastic in terms of saving time and customizing software. UIMS are also getting a lot of at-

"If you can handle a mouse and read what's requested, you'll be able to design an interface."

TOM GREENE
APOLLO COMPUTER, INC.

tention because many companies are trying to integrate software over a number of diverse machines and trying to give a consistent view to user interfaces."

A logical extension of the UIMS/windowing connection is to merge UIMS eventually into a more advanced windowing system like X Windows from MIT, a process that Apollo is scheduled to undergo soon with Dialogue.

According to Framm, "All the windowing developers are looking for something to sit on top of their windowing systems. UIMS is a natural fit."

Larry Timmons, a research analyst at the Gartner Group, Inc., in Stamford, Conn., says that UIMS can be broken into a few evolutionary generations, with most graphics and windowing systems such as Apple Computer, Inc.'s Quickdraw for its Macintosh and Microsoft Corp.'s Windows taking up the bottom tier.

"These are first-generation UIMS because they are single, unbroken systems that span from the data access level all the way up to the desktop," Timmons says. "They are also proprietary in that they're embedded in the kernels working with the operating systems or, in Apple's case, read-only memory."

Timmons adds that next-generation UIMS will be represented by products, such as X Windows and Sun Microsystems, Inc.'s Network Extensible Window System, which have user interfaces and enable users to move and share information across windows. Beyond these are UIMS such as Template's Blox and Enter/Act.

To date, however, such systems fit programmers much more than end users, Foley says.

"When you look at the integrated development environment with things like Microsoft's Windows, Digital Research, Inc.'s [Graphical Environment Manager] and X Win-

dows, for example, what they give you is a tool kit that you access as a programmer, not as an end user," he explains.

And that situation is running counter to the designated aim of UIMS to involve the average end user heavily in interface design.

Precision Visuals' Cardwell, for instance, points out that a major UIMS benefit of floating the user interface code separately from the application code is the possibility of rapid prototyping, a process that can pull end users directly into the planning and design process. "Responsibility for the success of a project will now be shared by end users and the development team," Cardwell concludes.

Though most of the UIMS on the market still require users to have some programming expertise and a familiarity with computers, those prerequisites are slowly changing.

Tom Greene, manager of the user environment and graphics kernel departments at Apollo, claims that the UIMS user does not have to be as knowledgeable today as in the past.

"There still has to be some level of understanding, though that's going to go away entirely in the near future," Greene says. "If you can handle a mouse and read what's requested, you'll be able to design an interface."

Direct manipulation

To make that easier for the end user requires a push toward graphics and direct object or pointing-type manipulation input and away from natural languages and command-driven interfaces.

"A command language format requires the user to go through a command step by step," Shneiderman says. "With direct object manipulation, you can just use a mouse or pen to point to where you want [to go]. The challenge in direct manipulation is building UIMS that deal with alternate input devices such as pointing, touching, mice and so on and also deal with graphical objects."

Foley agrees. "Natural language interfaces are important but overplayed," he says.

"Typed input is very slow, and it seems to work well with data query applications, but can you imagine doing computer-aided design using natural language keyboard typing and having to type, 'Please pick up the round object in the center of the table,' instead of just pointing to it? Even in verbal interactive systems you can limit the way people can communicate. Showing a person what to do can be better than telling them," Foley says.

Most UIMS are headed toward such object-oriented, or direct manipulation, UIMS.

Greene says these systems are the next generation of UIMS and claims they will have an even more radical impact on produc-

tivity. Greene even predicts that UIMS products offering users pure object-oriented interfacing will appear commercially within a year.

The ultimate aim of UIMS, however, is providing more independence from specific input devices.

"If you're developing software to run on IBM Personal Computers or Macintoshes, then you might not care," Foley says, "but if you're a CAD vendor and you want your applications to run on Sun Microsystems machines, Apollo machines and so on, then you care about independence from input devices."

Part of this independence can be accomplished by supporting such emerging device-independent standards as the Graphical Kernel System and the American National Standards Institute's proposed standard, the Programmer's Hierarchical Interactive Graphics System, or PHIGS.

"Basing the interface on certain standards helps consistency," Greene says. "It allows a company that likes to pull down menus and wants them to look a certain way across the company to still be able to add their own object from another vendor and maintain consistency."

"Because they only add the object once into the UIMS, they don't have to go to all the applications that want to use it. They add the code once into the UIMS, and then everybody can use it," he adds.

"Some researchers who looked at code developed during the past 15 years found that the percentage of code devoted to user interfaces had increased from about 10% to 70%."

BEN SHNEIDERMAN
UNIVERSITY OF MARYLAND

Timmons says that another key element now missing in UIMS is a definition of a universal presentation interface.

"There is no common user interface tool kit, no general user interface management system structure commercially available that allows a user to choose between a windows architecture, a speech-only architecture or, perhaps, something more exotic like a visual recognition system coupled with natural languages where it's appropriate," according to Timmons. "The main goal of UIMS is to provide a set of tools so that users can determine how information is going to be

presented," he says.

The bottom line in all of this is productivity. "If it takes a morning to lay out a screen in Cobol and it takes only 10 minutes to do it with one of these [UIMS] tools, you're going to see a lot more benefits," Shneiderman says.

"We now have an environment in which the UIMS is in charge of the interaction with users," Foley says. "That provides a framework in which we can build good Help facilities into the UIMS, maybe even some expert system capabilities to help tutor the user."

The Koffler Group's Potosnak says UIMS help define the user system interface at an abstract level, using higher level languages instead of Fortran, Assembler or Cobol. This fact, combined with rapid prototyping capabilities, makes for quick on-screen mock-ups and testing.

User testimonials

Users are providing their own testimonials on UIMS productivity. Bechtel's Wiley says Enter/Act has supplied his firm with a rich set of tools for dealing with users so they don't have to sit down and code.

"Instead, you can define how you want to relate to the user, and you can plug that into a set of files, pass it through the equivalent of a compiler and get a binary out that Enter/Act will understand and do for you," Wiley says. "So you can put an interface up quickly, bring a user in, sit him in front of the machine, watch him run through it and find out if he's comfortable."

Jim Sills, a staff computer analyst at Amoco in Tulsa, Okla., says the user interface that the company developed using Apollo's Dialogue UIMS will now be ported to six other in-house engineering applications, saving the company a great deal of time and effort.

"How important are UIMS? Some researchers who looked at code developed during the past 15 years found that the percentage of code devoted to user interfaces had increased from about 10% to 70%," Shneiderman says. "User interfaces are hot topics."

Template is quick to point out that a stock brokerage firm and other nonscientific firms are users of Template's Blox UIMS, not just scientific firms.

"UIMS will affect programming across all industries," claims Gary Romans, manager of Template products.

"In many ways, UIMS represents the last frontier in the development toward computers being available for arbitrary people doing arbitrary work," Foley says. "UIMS and other programmer productivity tools that deal with high-quality user interfaces are where the real action will be for the next few years." ♦



Software engineering's frontiers

BY MICHAEL TUCKER
FEATURES EDITOR

Software engineering is a curious term. Until recently, one computer scientist notes, "it was a dirty word. I mean *two* dirty words." Programmers felt, and to some degree still feel, that to engineer software was to strip programming of its creativity.

Those MIS managers who

had experimented with the concept, meanwhile, found that while it might be useful in the scientific and engineering communities, there was little software engineering could give to commercial, real-world programming.

However, two things have begun to change that thinking. First, software engineering tools and techniques are being modified to fit the requirements of commercial programming. Second, as MIS officers' roles shift from being purely operational to

executive, MIS is now managing huge software development and maintenance efforts that, in some cases, dwarf the scientific/engineering efforts that gave rise to software engineering in the first place.

MIS is turning to software engineering techniques for reasons having as much to do with management as technology. It simply must have some method of keeping control of its code.

In general, software engineering means that rather than simply hacking away to produce

code, a structured methodology is employed. There are various ways of structuring, but ultimately, most of them boil down to the idea that code development follows a planned life cycle.

Software partisans divide that life cycle into five major segments: specification/analysis, design, implementation, testing and maintenance.

A number of companies now market products that fit into one or more of the cycle's phases,

A CASE study in vendor strategy: See the life cycle chart, page 36.

Vendors strive for full-fledged 'CADME'

SPANNING THE DEVELOPMENT life cycle is the dominant theme of the current software engineering industry — vendors are either bringing out families of products, with one member for each segment, or they are hurrying to secure links with other vendors' products that fall further down the cycle than their own.

Computer Associates, Inc., located in Garden City, N.Y., best represents the first strategy. Early this year, the company announced the CA-Programmers' Workbench, composed of 10 individual tools.

Meanwhile, Index Technology Corp. in Cambridge, Mass., represents the second game plan. Index, with its Excelsior analysis and design tool, was one of the first companies into the commercial computer-aided software engineering (CASE)

world. Now, it is forging strategic alliances with other CASE vendors.

Ed Acly, senior consultant with International Data Corp., a Framingham, Mass.-based market research firm, says he feels this trend is actually creating a technology.

"We see an evolution away from isolated tools to a complete development environment," he says. "To describe that environment we coined our own acronym — CADME, for computer-aided development and maintenance environment."

Acly notes, however, that even the broadly based Computer Associates' product is a long way from the complete CADME operation that he envisions. "It is going to be a long journey," he notes.

How far is that journey? T. Capers Jones, formerly a consultant in the software engineering busi-

ness and now chairman of Cambridge, Mass.-based Software Productivity Research, Inc., did a major study from 1983 to 1984 looking into the discrepancy between current product offerings and what software developers really need.

Among the conclusions, he says, "We estimated that the full-fledged set of tools required [for complete CADME applications] would number about 110; most tool kits today provide maybe 30 tools. Moreover, we estimated that it would cost roughly \$85 million to do the necessary development."

He explains, however, that gradually that price will be paid — not all at once or by one company. Instead, the investment will be made by a number of organizations, bringing out increasingly interconnectable products between now and the end of the century. — MICHAEL TUCKER

and these firms are hurrying to secure links with other vendors' products up or down the cycle. Others, mostly recent entries to the software engineering market, are attempting to span the entire spectrum.

At the very beginning of the life cycle is specification/analysis — the process of deciding exactly what it is that one wants the application to do.

The software engineering aspect comes into play in that, traditionally, this process has been left to end users. And, as MIS has discovered, end users may not know exactly what it is they want their systems to do.

One of the more well-known system analysis machine vendors is Cadre Technologies, Inc., headquartered in Providence, R.I. Cadre markets Teamwork, a group of workstation-based products that effectively automate a method of representing tasks originally developed by Edward Yourdon and Tom DeMarco. (Yourdon's book, *Managing The System Life Cycle*, Yourdon Press, 1982, remains one of the most influential texts in the profession.)

However, Cadre has specialized in the scientific/engineering areas. In the commercial DP

world, the leaders are Nastec Corp., located in Southfield, Mich., and Index Technology Corp. in Cambridge, Mass. In fact, Nastec claims that its Designaid analysis product was one of the first CASE tools in the world. Designaid runs on the IBM Personal Computer and on Digital Equipment Corp. Vaxstations. It costs \$6,900 for the PC version and \$12,400 for the VAX version.

Meanwhile, Index says that its system analysis product, Excelsior, has the largest installed base of any CASE product worldwide. Excelsior is a PC-

based system costing \$8,400.

Critics question whether these systems are really superior to working out problems with a pencil and paper. However, users of these products seem to feel the systems are more than worth their cost.

One Excelsior user is Barbara Bouldin, staff manager at an AT&T commercial DP operation in New Jersey.

"I'm in charge of data management for my particular part of AT&T. I've got hundreds of analysts and thousands of end users," she explains. "We're using [Excelsior] for data analysis

and data administration, and we're moving on to using it for applications as well."

The next step in the cycle is the design of code. Cycle advocates describe the design stage as the business of blueprinting the application. It would differ from the actual writing of code in the same way that an architect's design of a house differs from a contractor's construction of it.

CASE tools to support this stage of the cycle are beginning to emerge. In fact, users report that system analysis tools can easily extend into design. AT&T's Bouldin says, "We've got all kinds of users — everybody from analysts to planners to testers. That's something I've learned from all of this. When you're buying software, you never know who your end users are going to be."

She notes, for example, that Excelsior's code specification could be rapidly transformed into code design. "We were doing some interfaces between departments," she says.

"We'd have a meeting with the planners, and they'd say, 'Give us a picture of what's going to happen at such and such an interface.' We'd run a report, and they'd take it off to their task forces," Bouldin explains.

Electronic Etch-A-Sketch

However, some of the best code design is being done without CASE at all. "Sure, you can speed things up a bit with an electronic Etch-A-Sketch," says James Janossy, manager of the City of Chicago Datacenter and author of *Commercial Software Engineering*, John Wiley & Sons, 1985. "But there's an awful lot you can do with a pencil," he says.

Janossy is one of the few advocates of software engineering

Acting as an interpreter

Many software developers feel that what is needed in this area is some kind of intermediary — specifically, a systems analyst — who can stand between MIS and users. This person would function almost like a knowledge engineer, helping users clearly define their needs, converting those requirements into technical terms and passing those specifications on to programmers.

Systems analysis is, of course, its own profession and one that is beginning to be quite separate from computer programming. Whether or not the MIS department has professional systems analysts on staff to assist in the process, it can exploit a number of products to make systems analysis easier.

These products range from various flowchart systems that require nothing more technical than a pencil to very sophisticated workstations. Indeed, the first computer-aided software engineering (CASE) tools sold were system analysis machines, and they still form the vast bulk of the market.

The software development life cycle

Where the vendors fit in

VENDOR	SEGMENT	Specification	Design	Code	Test	Maintenance
Cadre Technologies, Inc.						
Computer Associates International, Inc.						
Dialogic Systems Corp.						
Index Technology Corp.						
Nastec Corp.						
Softlab, Inc.						

CW CHART

to work almost exclusively with Cobol. He is also unusual in that in his system of notation, he avoids standard flowcharts. In fact, Janossy holds flowcharts responsible for software engineering's failure to catch on in the commercial DP world.

"People were burned by flowcharts," he says. "Flowcharts were supposed to make programming easier, but actually they were too complex and inflexible. Twenty years ago, there were already stories of programmers rebelling against them."

Instead, Janossy uses a system of notation that is adapted partly from the charts developed by Jean-Dominique Warnier and partly from classical logic. Janossy has also worked out a series of generic component designs that can be used as building blocks in larger programs.

Janossy has experimented with structured design in two places — at De Paul University in Chicago, where he is an associate professor, and at the Chicago Datacenter.

"It's done wonders," he says. "I've taught several hundred students at De Paul in Cobol. [With structured design,] these kids will do in two days what I've seen journeymen do in a month or more. And, they get it right in three compiles. To me, that's productivity."

Getting down to coding

The next step in the life cycle is implementation, or the actual coding.

Bruce Lynch is president of the Programmer's Shop in Hingham, Mass., a firm that specializes in tools for programmers. Early this year, the Programmer's Shop surveyed its customers to find out what they were using to increase productivity.

According to Lynch, "There are six different categories of tools currently being used to increase productivity. In decreasing order of acceptance by programmers, they are: traditional editors and utilities, reusable code, interactive languages, alternative and fourth-generation languages, application domains and esoteric technologies." As a potential seventh category, Lynch adds code generators.

"The trade-offs in each," he says, "are in productivity vs. control." In other words, the further a person gets away from the hardware, the more productive he is but the less control he has over the machine.

Thus, a programmer working in machine code would have exquisite control over the computer but abysmal productivity. By the same token, someone working in a fourth-generation language would be much more productive but have less control of the machine.

At the moment, Lynch says, traditional tools, such as third-generation languages and editors, are by far the favorite of programmers. "They give you so much control and flexibility that it's just hard to beat them," he says.

Reusable code is the programmers' second-place choice for programming productivity. "In our survey," Lynch reports, "70% of the respondents said they reused at least parts of their own code. Some 52% are using code from commercial software libraries."

The programmers ranked interactive languages third for productivity. Essentially, these are languages that are interpreted rather than compiled.

"Their big drawback is speed," Lynch

Wanted: A hero in the programmer's shop

IT ISN'T EASY committing to software engineering.

Everybody knows software engineering techniques can improve programmer productivity. But, it is also difficult to prove that contention — particularly to cost-cutting chief executive officers whose tolerance for technology of any form may be rather low.

This reluctance by top management is one of the reasons why MIS departments have been relatively slow to adopt software engineering.

"The delay is there because MIS managers are risk-adverse people," explains Michael Braude, vice-president of the software research center of the Gartner Group, Inc., a consulting firm located in Stamford, Conn. "And these are risky technologies."

According to Braude, MIS departments gradually will indeed adopt software engineering tools, particularly as those tools are made part of IBM products. "It will happen, but slowly," he says. "By the year 2010, perhaps, they will be standard," Braude predicts.

In the meantime, the MIS departments that adopt software engineering will be those with an advocate within their ranks.

"What you need," Braude claims, "is a hero in the shop. Some forceful, aggressive guy who is willing to take risks. . . . There just aren't that many heroes out there."

The organization that does not have some MIS officer brave or crazy enough to risk a career on software engineering can still experiment with software engineering products by setting up an advanced technology group in house.

This group would be a research and development division in which new technologies could be examined in isolation from the rest of the organization.

"Large accounts should set aside a research and development budget to experiment with these technologies," Braude claims. "I wouldn't recommend that people commit themselves wholesale, but they should definitely experiment." — MICHAEL TUCKER

says. With interpreters, programmers' productivity is higher because they can spot bugs on a screen as they occur rather than following a failed compile. But, because the interactive languages are not compiled, they are also slow. However, he says, "Several firms are attempting to overcome this obstacle."

For example, Natick, Mass.-based Rational Systems, Inc. is currently marketing an incremental compiler for the C language. Known as Instant-C, the product combines an editor, compiler, interpreter, debugger, source code formatter, object code linker, source code checker and runtime checker into one package for the IBM PC. It costs \$495.

Alternative languages, fourth-generation languages and artificial intelligence languages such as Prolog came in fourth in the programmers' ranking because, according to Lynch, these products "suffer from all the problems of interactive languages, plus they're slower."

Application domains

Application domains placed fifth. This classification includes applications that allow some degree of programming within them, such as Lotus Development Corp. 1-2-3, Ashton-Tate Dbase II, various data base products and so on. Application domains provide still less control of the hardware, but, Lynch claims, "Programmers can and should consider them if their applications lend themselves to those products."

Esoteric, or nontraditional, technologies, which received a sixth-place showing, include such things as CASE and objective programming, Lynch says.

He also considers code generators as an esoteric technology but one which is growing in importance — so much so that it may soon have to be considered a seventh general class.

This code generation category may be the programmers' least favorite, however. This class of tools may eventually replace the programmer job function because they hold the promise of automating coding efforts.

According to Ed Acly, a senior consultant at Framingham, Mass.-based market research firm International Data Corp., "The bottom line is that [software developers] start working toward the automa-

tion of code production."

Once the code is written, the developer faces the business of making certain it works and, after that, of keeping it in operation for years at a time.

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SOFTWARE PRODUCTIVITY

SOFTWARE ENGINEERING

Fortunately for programmers who do not relish the task, there is a whole industry of testing tools available.

In general, there are two types of testing tools: those that are stand-alone but are forging links with products up and down the life cycle and those that are part of larger families of products.

For example, Computer Associates International, Inc. in Garden City, N.Y., recently began to market a group of software engineering products known as the CA-Programmers' Workbench. Four of the workbench's seven components can find use in code testing and debugging as well as in the maintenance phase of code later on.

CA-Programmers' Workbench is also

"People were burned by flowcharts. Flowcharts were supposed to make programming easier, but actually they were too complex and inflexible. Twenty years ago, there were already stories of programmers rebelling against them."

JAMES JANOSSY
CITY OF CHICAGO DATACENTER

interesting in that it is one of the first CASE systems meant for commercial software development, particularly in the areas of IBM's CICS and Cobol.

Another vendor of a cyclewide CASE system is Softlab, Inc., headquartered in San Francisco.

Softlab's Maestro product runs on a

minicomputer and supports programmers on various 32-bit workstations. Among its approximately 30 tools, Maestro contains seven testing facilities.

Beyond testing, but not always clearly distinct from it, is the life cycle phase of maintenance.

Software maintenance has a history of

being the least glamorous and interesting of all aspects of software development. Yet maintenance is slowly becoming the single most important issue in software. Increasingly, programmers deal with established code rather than new projects. The current code must be repeatedly modified to allow for new applications without introducing fatal bugs in the process.

The industry is now in a desperate race to make code maintainable. A number of different products address the problem, ranging from automatic code restructuring programs to object-oriented programming languages.

Perhaps the most unexpected maintenance product is an emerging class of maintenance engines — computers that are at least partly dedicated to the business of managing source code.

For example, San Jose, Calif.-based Dialogic Systems Corp. sells a CASE system known as the Development Center Workbench. This 32-bit microcomputer was designed to fit between a mainframe and a mainframe controller.

Originally, the Development Center Workbench seems to have been meant for remote development. For years, programmers in the engineering and technical fields have done source code development away from the mainframe. They have worked on individual workstations and only after a complete debugging did they then download the applications to a target system.

Dialogic Systems' workbench applied the same principle to commercial computing.

With Development Center Workbench, Cobol programmers can perform their work remotely and, thus, save mainframe time for other DP tasks. Some of Dialogic Systems' customers use the product in exactly that way.

But perhaps, to the company's surprise, the area in which the product really seems to be taking off is in maintenance. MIS people seem to be using Development Center Workbench not so much for development — if they can, they leave that to code generators — but to troubleshoot existing applications.

Project management issues

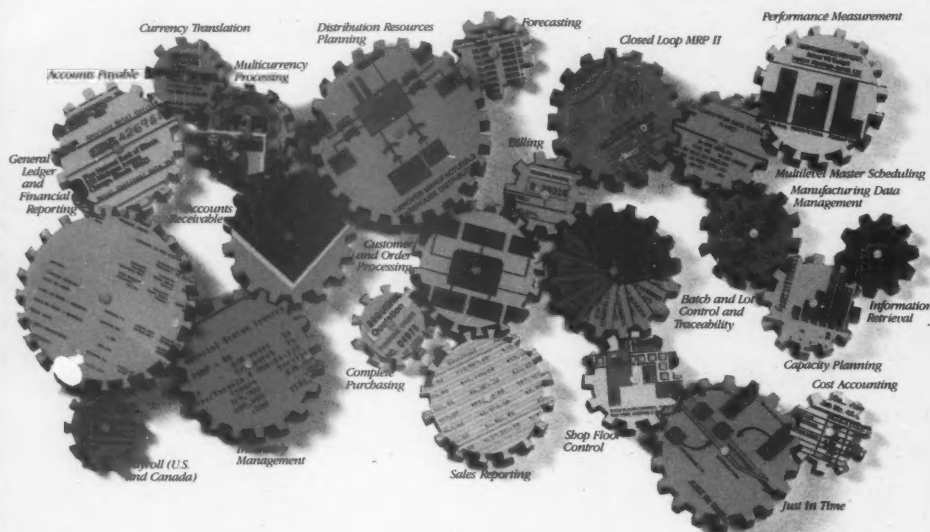
Beyond the development cycle, there are a number of larger issues. Some of these, in fact, are so large that they begin to do curious things to the term "software engineering."

For example, in even small development efforts, the management of the cycle can be astonishingly complex. Systems analysts, teams of programmers, end users, systems integrators, vendors, different products — all these and more must somehow mesh into a functioning whole. Project management, thus, becomes vitally important.

And, indeed, project management software is showing up with increasing frequency in CASE product offerings.

Furthermore, as the size of the development effort grows, MIS people become more managers of projects and less managers of technology. "Well, I suppose I always like to think there's still a little programmer in me," AT&T's Bouldin says. "But I guess I'm a manager these days."

As a result, the distinction between software engineering and corporate management may begin to get a little blurred. With a little effort, the difference might vanish entirely. ♦



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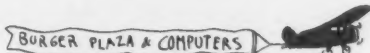


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Computers R Us

*Look who's in the
software business*



BY SANDY AUSTIN

There are a growing number of Fortune 500-class corporations recognizing the vast profit potential that lays within their own DP departments. These companies have committed millions of dollars to developing sophisticated software products to serve their business needs in competitive marketplaces. And many have come to realize that their products can be modified, packaged and sold as general applications to a

broad market, or the unique features of their products can be preserved and used to serve specialized, niche markets.

Hartford, Conn.-based Travtech, a wholly owned subsidiary of The Travelers Cos., was formed two years ago. Its primary

Austin is a Boston-based free-lance business and technology writer.

role is to market, package and sell software products and services developed in-house by Travelers' 3,000-member data processing staff.

According to Arthur Quirk, Travelers' chief operating officer and vice-president, "Data processing is typically looked at as a cost center for all businesses." But because Travelers has

an enormous software development organization that produces leading-edge data base management systems (DBMS) and network management products, Travtech was originally created "as a way to recycle development costs and establish a revenue stream for data processing," Quirk explains.

Today, Travtech's mission is



to turn Travelers' DP operation into a profit center and, ultimately, to change the common perception of data processing.

The issues surrounding this trend, which has attracted such major players as Citicorp, Manufacturers Hanover Trust Co. and Celanese Corp., all headquartered in New York, Weyerhaeuser Co. in Tacoma, Wash., Travelers and several Big Eight accounting firms, are plentiful.

The issues include such concerns as: How does a company select products to market? How do the in-house software professionals close to the products convince upper management to commit the money, time and human resources required to start up a new business as volatile and risky as selling software? How great are the risks of losing a competitive edge in your own marketplace when you sell proprietary knowledge embedded in a product? And, why should users buy from companies that are not first and foremost software vendors; that are, in fact, often competitors?

A vital key to success in starting up a software enterprise is corporate management's understanding of the business side of the venture. "The most common internal risk an organization faces is management's underestimation of the amount of time, money and effort it takes to make selling software a business as opposed to a business hobby," says Peter Brown, senior partner at Brown, Raysman and Millstein, a New York law firm that specializes in computer law.

'Competitive climate'

"A lot of companies look at the information industry as a potential second business because they focus on the big growth and profits of a giant like IBM," asserts Mel Bergstein, a managing director in the consulting division of Arthur Andersen & Co. "But," he continues, "what many fail to see is the very competitive climate and the immense investment demanded to get involved."

Literally millions of dollars go into an initial start-up venture, and, according to experts, the least amount of the cost goes to software development expenses. "The cost of developing applications pales when compared with the cost of documentation, training and maintenance for the product. And those costs pale when compared with the packaging and marketing investment," Bergstein asserts. "Arthur Andersen has been in the information business since 1952, but it took us 25 years to consider it profitable," he claims.

On the other hand, although Travelers formed Travtech only two years ago, Quirk reports that it actually made money last year. In fact, the company's five-year business plan estimates the

firm will double its size each year. "Our edge is that we have no heavy development costs," Quirk says. "The products we market are already paid for by in-house use at Travelers."

Synthetics to software

Celanese, a \$3 billion manufacturer of chemicals and synthetic fibers, got into the software business by forming New York-based Corporate Class Software, Inc. early this year. The initial start-up costs of the subsidiary were "well in excess of \$5 million," says Chief Executive Officer Richard Lyons. While the original investment took into account the funding for three products, only Fastar, a high-level financial reporting and analysis tool, has come to market.

"Celanese is very big on innovation," Lyons says. "It looks at the software business as a very high-risk, high-reward venture." Accordingly, Corporate Class Software is not a seat-of-the-pants operation. "Upper management looked at the big picture, considered all factors and assumed the position of, 'What will it cost to succeed?'" he says.

In the case of Corporate Class Software, once upper management was sold on the idea, it could go ahead and use the wealth of corporate resources — attorneys, tax specialists and management talent of executives experienced in managing multibillion-dollar firms — to add polish to the original start-up effort. The firm also hired outside sales and marketing professionals with software industry experience, relocated a number of development specialists from in-house DP and launched a major advertising campaign in *The Wall Street Journal*, *Businessweek* and two computer journals.

In short, Celanese is a good example of a corporation that fully understands the immense financial and human resources that go into launching a successful software business.

In contrast, "Most independent software companies are small, undercapitalized and never reach their full market potential," Brown asserts. "Many times corporate DP budgets are bigger than an independent software firm's entire revenue," Arthur Andersen's Bergstein concurs. While their sense of financial stability is always in question, Fortune 500-class firms have more than ample financial resources to successfully launch a start-up venture. In addition, Brown explains, "a new subsidiary or division directly reflects the parent company's reputation. So, there is an inherent sense of security present that is often missing from small, independent firms."

Convincing management to take the risk involves a lot of homework from internal sources

close to the product. "If you are proposing a software start-up, you must have internal credibility — someone in senior management not associated with the operation — that is willing to go to bat for you," Corporate Class Software's Lyons comments. The bottom line is to identify strong products that will appeal to a varied customer base or breakthrough products that address heretofore untapped areas.

Travtech's first product, Net-Pic, a visually oriented, quick-

"The most common internal risk an organization faces is management's underestimation of the amount of time, money and effort it takes to make selling software a business as opposed to a business hobby."

PETER BROWN
BROWN, RAYSMAN AND MILLSTEIN

alert network management program, was initially developed because of an outage in Travelers' Salt Lake City network hub. "IBM wasn't offering any products of this type at the time, and even though they do have IBM Netview now, it still lacks the capability to instantly view the entire network topology," Quirk explains. Thus, he saw Net-Pic as the perfect breakthrough opportunity — a chance to address an area of vital concern to a broad, cross-industry audience.

Chevron Corp.'s San Ramon, Calif., division purchased Net-Pic in January 1985. "We didn't have any tools to provide quick alerts to problems in the network," says Blake Wood, supervisor of network monitoring and performance at Chevron.

"We did have IBM's network management software tools — the Network Communications Control Facility and Network Problem Determination Application. But what attracted us to Net-Pic was its graphics/visual orientation. You can look over your shoulder, monitor the 40-in. screens and immediately detect if there is a problem," Wood says. "Plus," he explains, "Travtech was the only company that had a product like this at the time." Today, Net-Pic runs as a task under Netview.

Travtech attributes the same broad-based appeal to its new lead product, Traps, a personal computer-based host application tester and debugger. "This is a very hot area right now, and we are concentrating our 1987 marketing efforts on this product," Quirk says. Travtech's advantage here is that its competitors are mainframe software vendors. Because Traps is PC-based, it sells at a much lower price point — \$18,000 as opposed to the \$20,000 to \$30,000 asking price for competing products.

Travtech's marketing strategy takes into account the degree of functionality and success products have enjoyed in-house at Travelers and the belief that systems software products are easier to promote than applications. "Systems software is more prudent for a start-up to market because it appeals to a broader audience and has a shorter sales cycle," Quirk says.

For example, an application specific to the insurance industry would entail many more decision-making levels from the pro-

cess manufacturing, in which its expertise is strongest.

The firm's three major products are Worksmart, a maintenance management system that helps control costs by tracking equipment maintenance histories and parts inventories; Comp-track, a workers' compensation claims system for self-insured companies; and Excellerate, a transportation program that helps shippers compare and monitor truck and rail rates. As for services, Weyerhaeuser focuses on recovery services because of the broad, varied appeal.

While parent Weyerhaeuser is still the information systems subsidiary's largest client, 10% to 15% of Weyerhaeuser Information Systems' revenue will come from outside sales this year. And with its more than 350-person staff, the majority of which come from in-house DP with outside hires making up the direct sales team, the Weyerhaeuser subsidiary says it hopes to have a 50-50 split between internal and outside sales within three to five years.

By focusing on niche markets in which Weyerhaeuser Information Systems has built up most of its valuable in-house expertise and in which the parent company actively competes, is there a risk of giving away the competitive edge? Crowell says no. "We simply don't offer all [our] products for sale on the market. We will not market custom products developed for a client in a competitive position — be it Weyerhaeuser or anyone else," he asserts. "You won't find in general software houses the depth of experience we bring from the manufacturing arena."

Adding value

The financial services industry is feeling the competitive crunch to offer value-added products and services more than many other industries. Thus, it is not surprising that a lot of entrepreneurial marketing is coming from this arena.

Take, for example, MH Financial Management Systems, Inc. in New York, a wholly owned subsidiary of Manufacturers Hanover Corp. that was developed internally and has existed since the fall of 1983. It has four major PC-based product lines that focus on cash management and treasury-related functions. Called the Interplex series, the products, ranging in price from \$22,000 to \$50,000, are distributed through the electronic banking group and are sold in conjunction with other services offered by Manufacturers Hanover.

The catalyst behind these products was "the realization that the financial services business is becoming very specialized. Today, every service firm is

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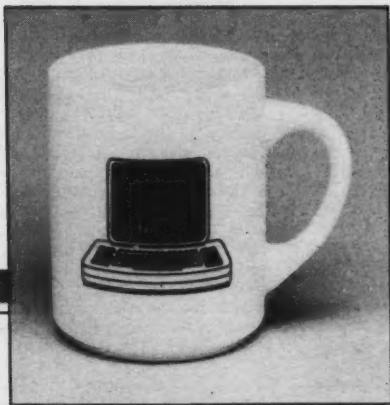
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getting into value-added processing," says Steve Groppi, vice-president of electronic banking product management.

Because of the fierce competition in financial services, world-class banks such as Citicorp, Chase Manhattan Bank N.A. and Bankers Trust Co. in New York will not buy MH's products. "One of our largest markets is with regional correspondent banks," Groppi explains.

Citicorp acquires Fame

Citicorp bought Fame Software, located in Dexter, Mich., five years ago after it was approached by the small, independent firm to buy its decision support system. "At that time, [the company] was called Gemnet, a venture capital start-up

that was going through financial problems," says George Vessels, Fame's chief operating officer. Citicorp revamped Gemnet's system from a broad DP product into a specific financial services product, using its in-house expertise in the banking and brokerage and forecasting fields. The new company took on the name of its Forecasting, Analysis Modular Environment product — FAME — and the tool is used throughout Citicorp as well as marketed via Fame Software's direct sales force to user communities in MIS and information centers.

What is unique about Citicorp's handling of FAME, according to Vessels, is that "where most corporations develop a product in-house and generalize it for the

commercial market, FAME was tailored to be much more specific to meet Citicorp's internal requirements and to focus on large banks and brokerage firms that are Citicorp's competitors."

Fame Software still has only its original product, but it offers numerous supporting modules.

The Big Eight accounting firms are, in many ways, the pioneers of entrepreneurship. With their vast stores of in-house experts who cover every conceivable application and system planning, design and development area, product marketing naturally grew out of their consulting operations and custom development work.

"We bring a lot more knowledge to the development of an application than most

software developers," says George Rittersbach, director of Peat, Marwick, Main & Co.'s Information Technology Group. "Our consulting staff covers all industry segments from accounting, manufacturing, distribution, marketing and custom support functions. They are always involved in the first third of the product development phase."

The evolution of a packaged product often grows out of an original solution to a client's problem. The solution goes through the various design, production, implementation and testing phases, and after a long process, it may be formalized into a marketable product that requires documentation, a sales force, training and support.

Up until 1982, with the onslaught of the PC in corporate America, "We didn't see ourselves as selling a product but a service," says Steve Desmond, partner-in-charge of corporate computer-assisted tax services at Price Waterhouse. Today, the division offers between 20 and 25 different PC-based products under the umbrella of the Tax Management System. "We saw the opportunity to encode expertise to the masses via the emergence of the PC as a business tool," Desmond says.

Can't keep a secret

The general consensus among Big Eight firms is that they do not lose a competitive edge by loading their products with proprietary expertise. "If you keep all your secrets to yourself, they aren't worth much," Arthur Andersen's Bergstein asserts. "The products are only valuable if clients use them. Plus, there are contractual agreements that prohibit loss."

According to Desmond, "Sixty-five percent of the companies that buy our software are not audited by Price Waterhouse, therefore, many of the software sales bring in new, large consulting engagements." The average software sale is around \$75,000, while a consulting fee could easily run to \$100,000, he says.

But there is no doubt that the Big Eight take selling software seriously. "This operation is a first-class software company. We are not taking a backseat to anyone," asserts Bob Forney, partner-in-charge of the Catalyst Group, part of Peat Marwick's DP operation.

One of the most hotly contested issues in entering the software sales fray is whether contenders lose their competitive edge by giving away trade secrets, often to their very competitors in an industry segment. "Most companies do view software as a competitive weapon," says Brown of Brown, Raysman and Millstein. "But, because technology moves so fast, that edge is short lived. Companies need to balance that advantage against significant software sales and the growth of a new business," he says.

So, why should users buy products from companies that sell software as a sideline business? The value-added expertise many of these organizations offer in specific vertical markets as well as in broad, cross-industry areas such as finance, accounting and data base management can be a tremendous asset to any potential customer.

Additionally, major corporations with deep pockets have recycled development costs through internal use of the products and, thus, can bring the products to market at a lower price point than independents.

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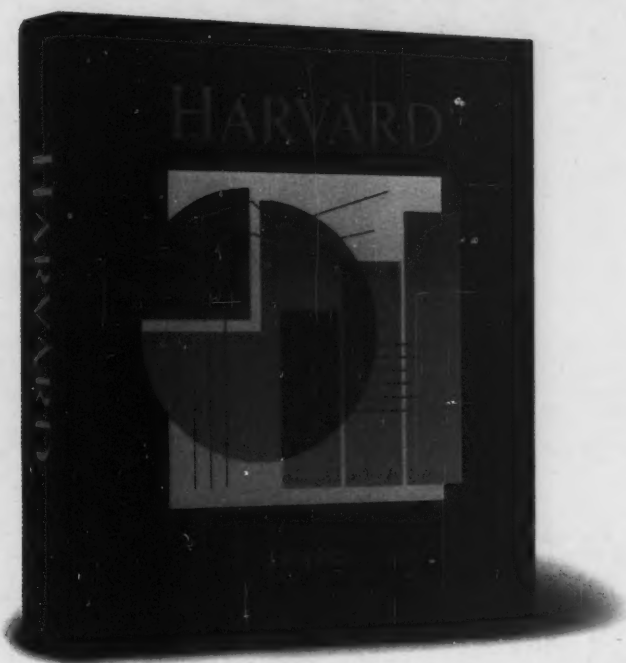
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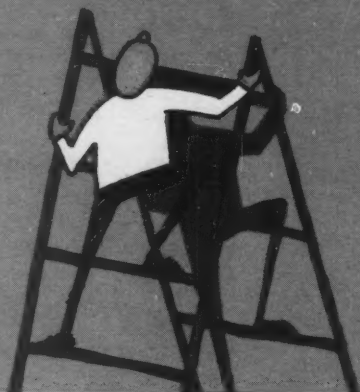
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Management in the 1990s

BY STAN KOLODZIEJ

The work being done in artificial intelligence software today is eventually going to find its way into the office. When that happens, it's going to create ripples of change in the relationship between management and computers.

A program under way at MIT in Cambridge, Mass., focuses on those changes. Entitled "Management in the 1990s," the ambitious five-year program consists of 17 related projects working under the official mandate "to discover how the rapid acceptance of computers in corpora-

tions is affecting companies and workers."

The project, directed by MIT's Sloan School of Management, is roughly at the halfway point in its research span, which is scheduled to end in 1989. Underwriting the program are such blue-chip corporate sponsors as Digital Equipment Corp., American Express Travel Related Services Co., British Petroleum Co., General Motors Corp., Arthur Young, MCI Communications Corp., Eastman Kodak Co. and the U.S. Internal Revenue Service.

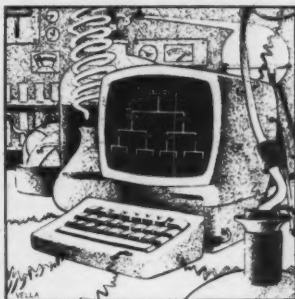
Many of the software projects promise to play a major role in shaping the very U.S. systems and management areas that these programs study.

"The 1990s study is a beginning, a chance to analyze and learn something about major management and computer issues," explains Roger Samuel, program manager of the 1990s project. "In the U.S. today, many things are happening because of the push of technology rather than the pull of the market. Yet it's amazing how poorly or incompletely explored this whole area of information technology is."

Many of the goals within the 1990s program and related MIT projects are directly aimed at increasing software productivity.

For example, one major project, called

Kolodziej is Computerworld Focus's senior editor.



*MIT project
looks to
the future
of MIS and
info systems*

the "Information Lens," has been looking at ways of using AI techniques to increase the effectiveness of programmers sharing and coordinating information, especially with systems like electronic mail.

"There are aspects of information sharing that we feel haven't really been looked into yet," explains Professor Thomas Malone, project leader for "Information Lens." "One problem is not having enough of the information you really need. This problem happens often enough with people working on different parts of a large programming project not communicating well when some programming changes are made."

"The other side of the problem is having too much information," Malone adds. "And that's a problem a lot of us are already familiar with in our paper environment. If anything, electronic communications systems simply increase the likelihood of our having electronic junk mail because they make it so easy to send many copies of a message."

Malone claims electronic communications systems can follow one of two paths: they can either aggravate communications or radically increase the bandwidth of communications in a positive way.

"What 'Information Lens' does," Malone explains, "is take advantage of not only the capabilities of computer technology to transfer information faster and cheaper but also those capabilities of the

technology [that enable it] to be more selective in the information that's being transferred."

Being selective is also being subjective. "What we do is let users specify rules about the kinds of information they'd like to see and the ways they would like to have it sorted and prioritized for them," Malone says.

"For instance, a programmer might set up a rule saying he's interested in any bug fix announcement having to do with an accounts receivable module or tape drive and so on. Such information can then be shunted into special electronic folders," he says.

To arrive at such rules, Malone and co-workers went out to several companies and conducted interviews with project managers and programmers about how they managed, assorted and prioritized the information they received, both with paper and with electronic systems.

"What we do is try and create a language in which people can express their own rules," Malone says. To help, Malone is providing users with a set of templates for different kinds of messages.

"A meeting announcement, for instance, would have a field for things like time, place, topic and so forth," Malone explains. "A bug report message would have fields for things like urgency, what system was being used and how to repeat the bug."

Involved in the MIT project for two years now, Malone says he and his colleagues have installed a prototype "Information Lens" system at a West Coast industrial research center. Malone adds that a number of companies

are interested in incorporating some "Information Lens" ideas into their own products.

"Information Lens" research requires a lot of programming resources of its own. Malone is using a Xerox Corp. 1100 series system bundled with the Xerox Interlisp D language and the Xerox Loops artificial intelligence tool system.

Malone has another ambitious project under way, a study of organizational structures and how they could spread use of information technology.

Malone says such research is enormously important because information technology is providing new business opportunities for companies.

Those firms that recognize opportunities can take advantage of them, providing a significant advantage over the competition.

"There are already a number of examples of interorganizational links between companies provided by information technology," Malone says. "An interesting example from our viewpoint is the airline [industry]. Both United Airlines and American Airlines have computerized reservations systems that link their computers and the computers of all the airlines to travel agents and sometimes even to travelers."

"Computer technology might be offering companies the ability to get into a new market or to radically change the way they do distribution or to change the communications infrastructure in their firms. Communicating the extent to which managers can see and implement the new possibilities is all-important."

Communications is also important to MIT's Richard Waters, whose "Programmer's Apprentice" project concerns itself with the way programmers talk to each other.

"A program is designed in the same way that you build a house," Waters explains. "In both cases, standard pieces are used and reused. In programming, we call these standard pieces clichés. Basically, these pieces are words that programmers continually use when they are talking with each other."

"With a house, when you say you want a certain vendor's windows, that's a definite term with definite meaning," Waters explains. "In programming, such a definite term is handled by subroutines. But when something a little more diffuse, like a concept, is used, there can be many implicit assumptions that go with it. In housing, the term 'Cape,' for example, relates to a whole set of implied facets that go with it, such as type of windows, roof design and so on. In programming, such diffuse terms are beyond subroutines. That's what we're working on."

And this project requires heavy-duty hardware and software in the shape of a Symbolics, Inc. LISP-based computer and bundled software. "Our program runs 40,000 lines of LISP code," Waters says. "It takes the Symbolics machine to the limit."

The result of "Programmer's Apprentice" research to date is the Knowledge-Based Editor in Emacs, a program editor that lets a programmer communicate with other programmers in clichés.

"The end result of all this research will be faster, more reliable program development," Waters explains. "It's also a big plus for [software] maintenance because the system, remembering clichés as they are used, will make it easier for a new programmer to come in and understand what a previous programmer was doing."

The 1990s study includes other important projects. Professor John C. Henderson, for example, is trying to identify ways in which expert systems and decision support systems research interrelate and how the result is changing the scope of corporate management decision making as well as programming.

At another end of the spectrum, Professor Michael A. Cusumano is updating software factories, a concept from the 1960s. Originating in the U.S., software factories have since languished here but have flourished in Japan with companies such as Hitachi Ltd. and Toshiba Ltd. in the research forefront.

"Software factories contain

the notion of centralizing large-scale software development into standardized, engineering-type environments," Cusumano explains. "The Japanese have shown remarkable software productivity gains with software factories, sometimes as much as five to 10 times that of U.S. counterparts."

Why did the software factory concept fade in the U.S.? Cusumano points to the reluctance of U.S. programmers to keep detailed catalogs of programming projects over several years, an important requisite of software factories and a way of keeping track of project costs and reusable software modules.

"The concept was imposed on programmers in the U.S.," Cusumano explains. "Management was never really behind it because it was expensive."

Cusumano says U.S. firms are now taking note. "There is a movement to rationalize more large-scale software projects," Cusumano explains. "Managers are under a lot of pressure to bring projects in on time and to make after-development maintenance easier. Software factories can do that."

Cusumano adds that such microcomputer software vendors as Microsoft Corp. are now showing an interest in software factories.

"Microsoft feels that it has to become more systematized in its software development," Cusumano claims. "Actually, it's not that farfetched. The operating systems for [Intel Corp.] 80386 microprocessor-based computers are going to be as long as mainframe operating systems

were a decade ago. The same factory software concepts might be applied to microcomputer software application projects."

There will be some hurdles. Cusumano says software factories are more a methodology than an actual product or set of tools. There will have to be accompanying changes in managerial attitude before software factories gain widespread U.S. use.

"Project managers will still resist [the software factory concept] because it's expensive. But what is really needed is a total organizational commitment like the Japanese have given, not just a nod from MIS," Cusumano says.

Many of the MIT researchers say they are finding that much of software research has now reached a critical evolutionary stage in which psychology, linguistics and other humanistic disciplines are assuming more important roles, taking on as much, if not more, relevance as logic and mathematics.

"My own doctorate [degree]

is in psychology," Malone says. "I think a lot of the new frontiers in the computer industry have to do with the boundary between computers and people. The limits of our understanding of how to make technology are in many cases less important than the limits of our understanding of how people will use technology. That opens research to a lot of disciplines."

What do the sponsors of the MIT study hope to gain from their participation?

"That depends on the sponsor," explains John Sifonis, national director of information technology consulting at Arthur Young. "There is the direct gain of channeling certain project results into a sponsor's product or services offerings. In our own case, we've used some of the expert systems research findings to bolster our own expert systems offerings. In hard currency, we calculate a \$1.7 million payback from diffusing this information throughout our company."

To keep the flow of information from the MIT project coming in and fresh, Sifonis says Arthur Young schedules frequent briefing sessions across the corporate board and uses its education and training group as an information conduit.

Various paybacks

"I think you'll find there are different reasons given [by sponsors] about the effectiveness of the MIT program and what they are getting out of it," Sifonis explains. "I know one of the original corporate sponsors dropped out quickly because they felt they weren't getting anything directly from the program."

If Arthur Young gets direct product benefits, Eastman Kodak's payback is a little more ethereal but just as important, according to George Mayo, the company's director of information systems technology. Though Eastman Kodak has a substantial interest in the overall project's research into imaging technology, Mayo says, it is the process of research that is more important than the tangible product.

"We're not expecting major [imaging] products to come directly from the 1990s study work," Mayo explains. "What it is doing for us is helping us rethink our research. It has opened up our thinking. The dividends will follow."

With research scheduled to end in 1989, the fate of the "Management in the 1990s" undertaking beyond that period is still being debated, according to program manager Samuel.

"There is no expectation that we will have answered all of the questions we've uncovered at the end of five years," Samuel explains. "The 1990s project, however, will always be remembered as an important start." ♦



Malone



Waters

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It's a dirty job, but...

Someone's got to do maintenance

BY GIRISH PARIKH

Few of us really enjoy performing software maintenance. Just as "I don't do windows" became an infamous cry of housekeepers everywhere, software maintenance tops the list of programmers' least favorite duties. But with an increasing supply of products requiring corrective changes, modifications and enhancements to keep up with user demands and tight budgets, software maintenance is not going to go away. In fact, just the opposite is occurring.

The statistics are staggering: 50% of MIS/DP budgets are said to be allocated to software maintenance

every year. Programmers reportedly spend 50% and, in some cases, 80% of their time on ongoing maintenance. Software maintenance is said to be a multibillion-dollar industry. Industry watchers contend that more than \$30 billion is spent annually worldwide on maintenance. The U.S. alone spends more than \$10 billion annually.

Recent work at MIT indicates that for every dollar invested in new system development, an additional \$9 must be earmarked for maintenance during the system's life cycle.

The message is clear. Improving software maintenance productivity can save a fortune. But it is hard to face software maintenance problems. If you hide the problems in a closet and show a smiling face to your superiors, you are doing a disservice to your employer as well as to yourself. The MIS/DP department exists to serve the users and the organization. Maintenance is the service business that keeps the company competitive and prospering. Ignoring maintenance can threaten the survival of an organization. And setting the wrong prior-

ities may cost you your job.

Even if software development is your priority, it makes sense to increase maintenance productivity. Every maintenance dollar saved by in-

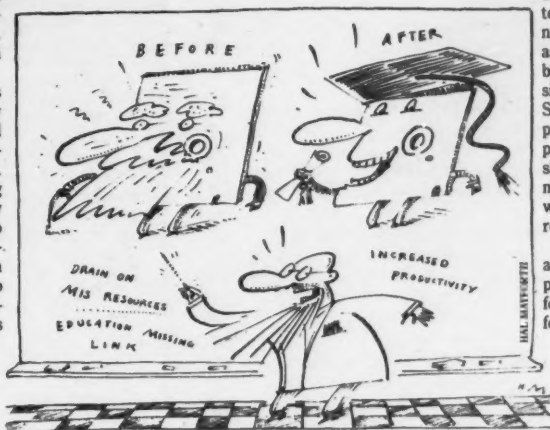
creasing programmer and manager productivity in both development and maintenance.

A collection of maintenance programming and management techniques is the essential base for increasing software maintenance productivity. The techniques can either be generic, such as problem-solving procedures, or be internal to the program or consist of external documentation. Some techniques can be specific to a particular software package or a programming language. A company should also put forth its own techniques for the effective use of software tools in a maintenance environment.

Programmers should demand and management should provide appropriate software tools for performing maintenance functions effectively, efficiently and economically. Most development tools can be continually used in maintenance, while some tools are designed primarily for the maintenance environment.

Without ongoing formal training of both programmers and managers in the use of maintenance techniques and tools, a company cannot achieve improvements in maintenance productivity.

It seems that the world of software



creasing productivity and by not cutting this essential service is a dollar available for development.

The keys to increasing productivity in almost any endeavor are the "three Ts" — techniques, tools and training. The three Ts are required for

Parikh is a Chicago-based national consultant, lecturer and author specializing in software maintenance and program productivity.

MAINTENANCE ISSUES

maintenance tools is about to explode. Tools abound for Cobol; the most widely talked about Cobol tools are the restructuring products that convert unstructured programs into structured programs automatically.

The available Cobol products include Structured Retrofit from the Catalyst Group of Peat, Marwick, Main and Co. in Chicago; Superstructure from Group Operations, Inc. in Washington, D.C.; Recoder from Language Technology, Inc. in Salem, Mass.; and Cobol/SF from IBM. Some vendors claim their products can achieve up to a 50% reduction in software maintenance costs.

In the world of Cobol tools for the IBM mainframe, the Maintenance Programmers Workbench put together by the Federal Software Management Support Center at the General Services Agency (GSA) in Falls Church, Va., is a landmark. The GSA has classified maintenance tools in the workbench into 11 categories and procured 10 tools (one tool satisfies two categories) by competitive bidding.

The tools are integrated using the infrastructure of the Rand Development Center from Alameda, Calif.-based Rand Information Systems, Inc. Draw-

ing from the pioneering work of the GSA, the MIS/DP departments in the industry and academia can also put together similar workbenches.

The following are the categories and the tools procured by the GSA:

- **Test coverage monitors.** The monitor the GSA procured is Analyzer from Aldon Computer Group in Oakland, Calif.

- **Translators.** Transit, the translator the GSA procured from Uccel Corp. in Dallas, converts most non-IBM Cobol to IBM Cobol.

- **Reformatters.** The reformatter the GSA procured is Hawkeye from Chicago-based Blackhawk Data Corp.

- **Data standardization tools.** The tool the GSA chose is Cobol Structuring Aid from Marble Computer, Inc., headquartered in Martinsburg, W. Va.

- **Cross-reference analyzers.** The tool the GSA procured is DCD II, also from Marble Computer.

- **Documentation tools.** The tool the GSA selected is Pathvu from Peat Marwick's Catalyst Group.

- **Source comparators.** The tool the GSA procured is Comparex from Sterling Software, Inc.'s Marketing Division

in Rancho Cordova, Calif.

- **File comparators.** Sterling Software's Comparex also fulfills this category.

- **Data manipulation tools.** The GSA procured the Xpert data manipulation tool from XA Systems Corp., located in Los Gatos, Calif.

- **Restructurers.** The tool the GSA selected is Structured Retrofit from Peat Marwick's Catalyst Group.

- **Code analyzers.** The tool the GSA chose is Via/Insight from Phoenix-based Viasoft, Inc.

Standard documentation techniques and automated tools can help boost maintenance programming productivity. There should be a standardized method of communicating information about code and system to the community of programmers.

What companies need is a standard, graphics documentation technique and an automated, preferably interactive, tool to support it. The tool should be integrated in the infrastructure of a maintenance programmer's workbench.

However, all the technological tools and fixes in the world won't help your organization's software if the people performing the function don't know how to use them. Believe it or not,

not many MIS/DP professionals are formally trained for a job that accounts for more than one-half of their job responsibilities — that of software maintenance!

This situation must change. The mass education of MIS/DP professionals in software maintenance is in order. Education and training can tie together the materials on maintenance technologies and tools and prepare professionals for performing the vital function of maintenance.

Professionals may pursue specialized training when appropriate. Also, general maintenance training should be ongoing. Companies need to develop education and training materials.

The programming profession is very demanding but at the same time exciting and sometimes frustrating. While meeting day-to-day demands — some requiring overtime — it is very difficult to think of anything else. But MIS/DP professionals should take some time off occasionally and try to look at their professional and personal goals. Some self-analysis can be revealing. Also, set up your own productivity improvement program. Such a self-improvement program can include studying articles and reading selected professional books regularly.

Multiskilled programmers are in demand, which puts a burden on programmers who want to specialize in one or two areas while having a working knowledge of other areas.

In addition to technical knowledge, interpersonal skills are also required for an employee to survive and even flourish in DP/MIS environments. Verbal as well as written communication skills are necessary.

Proficiency in system/program design methods, data/data base design techniques and, last but not least, maintenance programming tools and techniques is also important, but in most environments, these skills take the back seat. Mastering all of these topics while designing and maintaining programs is a formidable, if not downright impossible, task.

One solution may lie in the concept of chief programmer teams, in which specialization can be encouraged.

However, just because you are keeping the software up and running, you are not indispensable. Job security is a myth. The key to real security is in becoming a productive professional.

Management should develop a positive maintenance attitude and motivate programmers. It should also provide the necessary tools and training to the programmers. With support from above and a positive outlook, MIS/DP professionals can make the most of the opportunity to solve the problems of software maintenance, rather than avoid this necessary chore. ♦

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Circle Reader Service Number 33

Users debate 4GL virtues



BY REBECCA HURST

The fourth-generation language game draws a lot of attention, but few MIS professionals have come to the card table. Many who do, simply observe. Those managers who play the language game generally hedge their bets by using popular third-generation languages such as Cobol because, these users caution, the payoff from fourth-genera-

tion languages varies and is rarely immediate.

A good percentage of work in the mainframe environment is still written in Cobol, reports Dale Peacock, senior associate editor for Datapro Research Corp. in Delran, N.J. "Many [companies] are thinking about installing a fourth-generation language to handle their application backlogs," he says, but information systems managers have been slow to move, and money for new software is still tight. As a result, Peacock notes, "MIS is playing it a little cautious."

Hurst is a *Computerworld Focus* senior writer.

Another problem is that programmers are not ready for complex fourth-generation language application development, even if fourth-generation language products are, Peacock says. "Programmers don't have enough experience," he explains. "They feel more comfortable with Cobol or PL/I." Thus, only progressive companies that want to be at the leading edge of technology are working with fourth-generation languages.

"We were looking for tools that were state of the art," concurs Michael Johnson, director of information systems for Rochester, N.Y.-based Kodak Processing Laboratories, a business unit of Eastman

USER SURVEY

Kodak Co. Kodak, along with Kawasaki Motors Corp. U.S.A. and Southland Corp., are three companies using fourth-generation languages.

Different approaches

In part, the three firms represent the different approaches users are taking with these languages. Like the larger pool of fourth-generation language users, their commitment varies. While Kawasaki and Southland develop IBM mainframe applications based on Cobol, Kodak uses Fortran to write software for its Digital Equipment Corp. VAXs.

Fourth-generation languages have quickly come to play a major role at the U.S. division of Kawasaki, which is based in Irvine, Calif.

At the beginning of 1986, Kawasaki was still a Cobol shop, recalls Roger Peterson, the company's director of information systems. In February, though, the information systems department brought in Laguna Hills-Calif.-based Pro Computer Sciences, Inc.'s Pro IV language.

Five months later, the department put the first Pro IV-built applications into action.

Following the first software introductions, Pro IV use rapidly escalated. From July 1986 through December of that year, Kawasaki's information systems group developed 243 Pro IV applications, Peterson reports. In that same period, the company only brought 19 Cobol-based applications into action. In the first four months of this year, Kawasaki added another 186 Pro IV applications, he says.

Productivity increases, particularly for on-line transactions, were a primary incentive behind the rising use of Pro IV, Peterson says. "An on-line transaction application that takes one month to write in Cobol takes two days in Pro IV," he notes. Still, Kawasaki does not plan to move exclusively to the fourth-generation language. "If it's more effective to modify the software using Cobol, we will," Peterson explains.

Fourth-generation language applications are applied more sparingly at Dallas-based Southland, a company best known for its 7,519 7-Eleven convenience stores throughout the U.S. and Canada. The company has been using ADR/Ideal from Applied Data Research, Inc., located in Princeton, N.J., since late 1983.

"We already had ADR's Datacom/DB [data base management system], so it made sense for us to choose Ideal," says David Karney, Southland's vice-president of MIS.

Although Southland has used Ideal for more than three years, the company primarily uses the language for simple applications such as on-line screens and uncomplicated reports, according to Karney. "Ideal is good, but it offers no advantage over Cobol

for more complicated applications," he explains. "The bigger the project is, the less overall benefit a fourth-generation language provides." These languages do not address 75% of the application cycle, he says.

"A fourth-generation language has its biggest impact in only 25% of the application life cycle," Peterson agrees. "In the code-construction phase, 23 hours of programming in Cobol is equal to one hour in Pro IV," he says. In the remaining areas of the application cycle, third- and fourth-generation languages work about equally well.

Karney is more conservative about fourth-generation languages' advantages for smaller applications. "In a simple system without a lot of design and analysis, we see an average ratio of 5:1 in favor of Ideal," he reports. But, his assessment of Ideal's power is more optimistic than Peterson's. "In overall efforts, Southland sees a 2:1 improvement with Ideal," Karney says.

Kodak Processing Labs, a relative newcomer to fourth-generation languages, brought in Powerhouse in September 1986 after it won a copy from Ottawa-based Cognos Corp. Winning Powerhouse cut down on the fourth-generation language product evaluation process for Kodak because the firm was sizing up other languages at the time. More important, though, Powerhouse best provided the capabilities that Kodak required in such a tool.

The beta-test release of Powerhouse 5.04 met Kodak's requirements because its functions included support for variable length processing. The production version of Powerhouse that the company received in Sep-

"It's the responsibility of MIS to look at the situation and make the right choice."

MICHAEL JOHNSON
KODAK PROCESSING LABS

tember fell short because it did not handle this type of processing, Johnson recalls. "Without support for variable length processing, we couldn't use it with our existing VAX systems," he says. Therefore, in December 1986, Johnson told Cognos that there was little it could do without this capability.

Cognos then offered Kodak the 5.04 beta package, which supports variable processing, and Johnson accepted it. Kodak has since developed two reasonably simple sales reporting applications. "My programmers figure they have had a twofold to fourfold performance increase using Powerhouse instead of Fortran," Johnson reports.

In the future, Johnson sees

continuing roles for both Fortran and Powerhouse. "When you have an intensive on-line transaction-oriented application, Fortran is more efficient," he explains. These on-line transactions account for 25% to 30% of the systems developed. Another 30% to 40% of the software projects involve generating reports. "That's where Powerhouse comes into its own," he asserts. The remaining 30% to 45% is a gray area.

Kawasaki, Southland and Kodak also differ slightly in their assessments of who should develop software with fourth-generation languages. Kawasaki and Southland both say that information systems professional programmers will almost exclusively develop applications in their organizations. By contrast, Kodak's Johnson says that the Powerhouse query language is a good end-user tool.

However, the three DP professionals agree that allowing even experienced end users to write software with a fourth-generation language poses potential problems.

Concern about support

"Some of our experienced end users have the same kind of skills as our programmers and could develop systems themselves," Karney says. While these people are not limited technically, though, Karney is concerned about long-term support.

"If one person in a department develops a sophisticated system and then leaves the company, there's no one left who is familiar with that system," Karney explains. Even if the user remains, that person is primarily responsible for another job and may not have time to maintain or support the software for other users. Either way, Karney says, "We're left with the job of trying to support a product that we didn't build."

Johnson agrees that those concerns are valid. To avoid this problem, Johnson advises MIS professionals to be conscious of any end user building mainstream applications. "You need to talk with that user and get the application into the information systems [realm]," he says.

Although Kodak, Kawasaki and Southland differ in their commitment to fourth-generation languages and their availability to end users, the three companies share similar perspectives on their reasons for choosing these tools and the growth of these products' acceptance within the organizations.

All three firms cite a need to solve their application backlog problems with a fourth-generation language that is robust enough for the production environment. As such, that language has to handle both batch and on-line processing, they agree.

Tied in with these require-

ments is a need for limited performance degradation. "We were only willing to pay a 20% performance penalty by going to a fourth-generation language," Peterson says. Kodak would only accept a 10% to 20% increase in memory and CPU resources beyond that used by Fortran, Johnson agrees.

Other managers may have different requirements, though, Johnson suggests. "It's the responsibility of MIS to look at the situation and make the right choice." To assess a situation, managers need to compare the cost of memory and CPU resources to the cost of analysts and weigh that cost against a projected twofold to fourfold production improvement, he suggests. However, Johnson also notes that the decreasing costs of memory and hardware have made fourth-generation languages a viable alternative.

In selecting a fourth-generation language product, all three companies say they were concerned about compatibility with their existing software. For Kodak, a deciding factor was Powerhouse's ability to support all of DEC's data base file structures.

Compatibility for Kawasaki meant having a tool that could process IBM IMS data base management system files. The product also had to interface with a third-generation language. "I want to use existing Cobol programs as subroutines to the fourth-generation language applications," he explains.

Interfacing between Ideal and Cobol has been difficult, Southland's Karney says. To get the two to communicate, Southland must mesh Ideal and Cobol under IBM's CICS transactions. "That [situation] has limited the firm to writing only stand-alone applications with Ideal," he notes.

Once the three companies decided on a fourth-generation language and brought it into their shops, they each had similar experiences in getting their programmers to accept and use the language. All three DP professionals note that at least half of their systems analysts have begun working with the fourth-generation languages. All three also report that this usage was based primarily on project demands rather than specific design groups or preferences.

'They did not resist'

Many programmers in the firms were initially reluctant to use the fourth-generation language because they had worked so long with third-generation languages, the three DP professionals agree. But the Southland DP staff's reception was not a problem, Karney says. "Naturally, some programmers did not actively look for ways to use Ideal, but they did not resist it."

Programmers at Kawasaki accepted Pro IV in varying de-

grees. "Some had very strong concerns about it," Peterson says. "Others were eager to give it a try." Because staff members were used to programming in Cobol, a procedural language, many felt uncomfortable being confronted with nonprocedural Pro IV, he recalls.

In order not to discourage programmers, Peterson has allowed his staff to go at its own pace. Some have gotten over the learning wall in training classes, he says. Others do not get over until they finish their fifth or sixth application.

'Sense of satisfaction'

By that point, though, the programmers begin to realize that Pro IV gives them the ability to write applications a lot quicker than they could with other languages, Peterson says. "When they realized it was taking them a lot less time to solve problems, they began to get a sense of satisfaction."

At Kodak, Johnson saw a similar acceptance pattern among the DP staff. "The most difficult part was changing people's mind-set and convincing them that Powerhouse could do the same things as Fortran and make their lives easier," he says.

To bring in a fourth-generation language successfully, managers have to commit themselves and resources to educating and training their staffs. At Kawasaki, Peterson began indoctrinating programmers before selecting a fourth-generation product. "We kept the staff informed of what we were doing, our direction as the information systems department and what we were trying to accomplish. We informed them about the selection process and why we were choosing Pro IV," he recalls. "We wanted to minimize the impact of bringing in a fourth-generation language."

To make the actual training successful, managers must commit time as well as money, Kodak's Johnson asserts. "You have to make sure that you give your programmers sufficient time to go through the learning curve on their first applications," he says.

Developing the first application with a fourth-generation language will not be as easy as creating it with a third-generation language, Johnson claims. "If you expect a project to take 14 weeks, schedule 18 weeks," he suggests. With each successive project, managers can then bring the schedule back to 12 weeks, then nine weeks and less as they begin to see the productivity improvements vendors claim, Johnson says.

Kawasaki's Peterson concurs. "All of a sudden, you realize that you can develop a working application with very little development input, and that's where the payoff comes." ♦

Compiling the facts on toolboxes

Which product will ease the chore of coding for you?

BY WALTER KOZACHEK

Faster, better, cheaper. These three words make up the corporate mandate that MIS is expected to act upon. But sifting among the software choices to find the right work tool has become a confusing and exacting task.

Within the past several years compiler design, efficiency and documentation have improved dramatically. Cryptic or nonexistent docu-

mentation has given way to manuals that not only explain compiler operation but also give examples of language implementations, functions and usage.

Compiler designers have even carried the structural elements found in Pascal and C to Basic and have added many built-in features and libraries to Pascal and C. Recent developments have included interactive compiler operation such as that found in Microsoft Corp.'s Quickbasic and in Borland International, Inc.'s Turbo Pascal, Turbo C and Turbo Basic. New source code debuggers such as Codeview from Microsoft help to pinpoint errors quickly.

While these products help to reduce the compile-edit-debug cycle time, however, the actual chore of coding, which is already greatly eased by modular structured languages, can be reduced even further by using toolboxes or programming utilities.

In their simplest form, toolboxes are pre-written and debugged routines that free the programmer from writing code. These modules range from small functions that deal with screen I/O to more elaborate procedures that set up complex data files.

If you are faced with a choice of coding from the ground up or purchasing a particular set of routines that suits your needs, there are many advantages in buying a toolbox product.

One chief advantage is time. Often, the time

spent learning to use a particular toolbox is far less than the time it would take to actually code it. For example, writing an ISAM-like data management module would be far more work than learning how to set up record pointers for one.

Closely related to saving time is cutting expenses. The initial expense incurred in the purchase of a toolbox or utility and in learning time justifies the money saved in programming time. If some utilities seem costly, compare the cost to the cost of programming the same utilities in-house.

Because many vendors do not charge a royalty fee, the initial purchase price is the only expense. In addition, many toolbox vendors offer source code that may be altered to suit a special need, but some vendors may charge extra for this feature. However, adaptations of standard toolboxes that are too specialized may prove not to be worth the investment in programming time.

The modular approach to programming has proven an effective way to code, and programming utilities support this approach. The same routines can be used for different projects. In some instances, toolbox vendors offer products that can be used with different languages.

In fact, one of the most overlooked advantages of these routines is an increase in program execution speed by using a toolbox written in assembly language. The assembly language routine can be linked in with a program written in a higher level language. The programmer, programming in a higher level language, need only be concerned with correctly interfacing to



MICHAEL BARTALOS

Kozachek is an associate editor and analyst for "Datapro Reports on Microcomputers" a publication of Delran, N.J.-based Datapro Research Corp.

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TOOLBOX UPDATE

the assembly language routine.

The selection of toolboxes and programming utilities available has never been better. Not only do major compiler vendors such as Borland offer toolboxes, but many third-party vendors such as Blaise Computing, Inc. in Berkeley, Calif., add to the diverse supply of utilities.

The types of programming utilities and toolboxes vary widely, from floating-point arithmetic routines for assembly programmers to windows routines for C programmers.

No forgetting Cobol

While file management, screen control and graphics packages are available for languages such as Basic and Pascal, programming utilities vendors have not forgotten Cobol. Although the range of products is smaller for Cobol, there is still a fairly good selection of utilities available, such as Memphis-based Tajeve Software's Cobwork and Juneau, Alaska-based Northern Computing Consultants' ScreenIO. In short, there are programming utilities, toolboxes or tool kits on the market for most of today's programming languages.

To a large extent, the decision to purchase a toolbox depends on the language used. C, with its modular design and sparse, built-in functions, lends itself to many graphics and windowing products. Many novice C programmers coming from a Basic or Pascal environment experience a kind of culture shock when dealing with tasks, such as screen I/O, that are an integral part of the C language.

There are no built-in GOTOXY or LOCATE statements in C as there are in Pascal or Basic; C, like assembly, requires you to communicate with the hardware directly.

Screen I/O in C can be a tedious job, which is why there is such a lucrative market for C libraries. Many companies offer tools to help the programmer with screen I/O, windows generation and other graphics capabilities.

Blaise Computing's C Tools 2, Richmond, Va.-based Creative Solution, Inc.'s Windows for C and San Jose, Calif.-based Amber Systems, Inc.'s VSI-The Window Machine are some of the many products that fall into this category.

C compiler vendors recognize the shortcomings of the language. While programs written in C will execute almost as fast as if they were written in assembly, like assembly, C is not particularly user-friendly.

Tool kits or C libraries can help alleviate the language's inherent unfriendliness, and as a result, many C compiler vendors recommend or list library products that work with their compilers.

Because the C language is one of the most popular programming languages for microcomputers and is a modular language built on libraries, the market for C toolboxes is a competitive one. In effect, toolbox vendors are willing to round out the C language with aftermarket routines. Most C compiler vendors welcome these products as enhancements for their own offerings.

However, languages such as Basic and Pascal have not gone unnoticed by toolbox vendors. Unlike many other language vendors, Borland International provides a full array of tool kit options for its Turbo Pascal compiler and will likely do the same for its Turbo Basic and Turbo C compilers.

Although languages such as Basic and Pascal may not require as much attention as C in the area of screen I/O, tool kit vendors often supplement these languages by enhancing their graphics features. Borland's Turbo Graphix Toolbox helps the programmer create better windows and business graphics in Turbo Pascal, as does Blaise Computing's Turbo Power Tools and Del Mar, Calif.-based Paragon Concept, Inc.'s Super Tools. Enhanced screen control for Microsoft's Quickbasic is a common feature of East Norwalk, Conn.-based Crescent Software's Quickpak and Qbase. Qbase is also available for Turbo Basic.

File management utilities for Basic and Pascal are also available. Borland offers the Turbo Database Toolbox, a B-Tree ISAM filing and quick sort routines for Turbo Pascal. DB/LIB from AJS Publishing, Inc., located in North Hollywood, Calif., and Basic Development Tools from Sterling Castle, headquartered in Marina Del Rey, Calif., bring prewritten data base functions to Microsoft's Quickbasic and Borland's Turbo Basic.

Companies such as Computer Handholders, Inc. in Arcola, Pa., and Alpha Computer Service in Cypress, Calif., offer file management and screen control utilities for Fortran compilers from Microsoft, Ryan-McFarland Corp. and Lahey Computer Systems, Inc. in Incline Village, Nev.

Buying precautions

With so many toolbox vendors supplying a large selection of products, you must take some precautions in buying.

First, make sure the routines do what you want. This advice may seem obvious, but nothing is more frustrating than purchasing a set of routines only to find out that they fall short of what you wanted to accomplish. This realization could happen after you spend a lot of time learning how to use the routines. Not only will the purchase price be lost but so will the time spent learning the toolbox routine.

Try to get a clear idea of what the pro-

gram needs to do and what the routines actually can do. An example of mistaken capabilities might be in buying a C windowing routine that only creates titled windows when you need overlapping windows.

If no off-the-shelf routines satisfy your project's requirements, investigate how difficult it would be to modify an existing routine.

You may have an advantage in this situ-

Many novice C programmers coming from a Basic or Pascal environment experience a kind of culture shock when dealing with tasks, such as screen I/O, that are an integral part of C.

ation if you can find toolboxes that are written in the same language as the one in which you are programming.

Second, check what is included in the tool kit. Is the source code supplied? As mentioned, many vendors charge extra for this feature. However, source code may be essential if you plan to modify the routines. Is full documentation included? The more complete the documentation, the easier it is to learn the routines. Is there a tutorial or sample program included? Learning time can be reduced by reviewing good examples.

Third, many vendors offer package deals that group similar utilities together. These packages can save money and time and can be more convenient. However, make certain you understand what the package includes. For example, screen enhancements do not necessarily mean windowing capabilities.

Fourth, check for royalty payments. Most toolbox vendors do not charge royalties on their products, and, in most

cases, this fact is clearly stated in their advertisements. However, doublecheck — it is better to be safe than sorry.

Lastly, ensure that the routines or utilities will be compatible with your compiler. Toolbox vendors often have several different versions of their products to accommodate different compilers. Also check for compatibility in the actual version of the compiler. This step is especially important if your compiler is not the current version that a company offers. Most compiler vendors publish lists of compatible products.

Some drawbacks

For all the advantages toolboxes provide, these products also have some drawbacks.

One disadvantage is the state of the documentation found in today's products. In general, toolbox documentation lags behind compiler documentation. Similarly, there are a variety of different programming utilities available, but a substantial amount suffer from poor or marginal documentation. The situation is improving, but documentation should be an important factor in your purchasing decision.

Furthermore, many times the comments in source code can stand improvement as well. C or assembly language routines with little or no commentary make the routines almost impossible for a programmer to alter or understand.

One of the biggest disadvantages of a toolbox routine is the amount of time required to learn how to use it. In addition to conquering the stigma attached to products not produced in-house, you must overcome the long learning curve required for complex toolboxes. Moreover, some people view the time spent learning the routine as time better spent writing it and consequently knowing the routines thoroughly.

Careful programming toolbox or utility selection can mitigate xenophobia and programmer cynicism and shorten program development time. ♦

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Humanizing the machine

AI bridges the man-machine gap

BY LARRY R. HARRIS

During the past 15 years, there have been many productivity aids introduced to benefit MIS, but none offers the long-term potential benefits of artificial intelligence technology. In a sense, although AI is merely a set of new programming paradigms, when it is combined with existing applications and data bases, it has a positive impact.

There are two major commercially viable AI market segments: natural language

and expert systems.

A natural language computer system is one that understands and translates natural language into a formal computer language. The real power of natural language comes from the definitional structure on which the translation is based. The primary function of a natural language system is to map from the user's conceptual view to the data base management system's logical view, much like the function of the DBMS is to map from the logical view to the physical view.

Natural language technology benefits MIS in a variety of ways. The most obvious benefit is the indirect use of a natural language to reduce the MIS backlog by making end users self-sufficient. Instead of writing custom reports, major corporate MIS departments can simply maintain

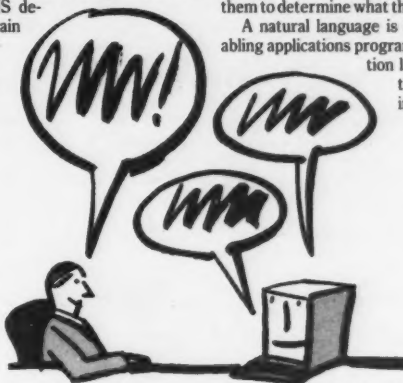
data bases and use a natural language to disseminate information. Once MIS gives users a tool that allows them to be self-sufficient, MIS may find that users are happier doing the work themselves. The result is a rare win-win situation between MIS and users.

Natural languages also offer many productivity benefits directly to MIS, including data base application development and maintenance, applications prototyping and IBM SQL code generation and training.

Perhaps the most important benefit of such tools is the use of natural languages for prototyping. Small mock data bases can be quickly defined inside the natural language system and presented to users. Giving users these mock data bases early in the development cycle allows them to determine what they want.

A natural language is also an excellent tool for enabling applications programmers to learn data manipulation languages such as SQL and to transfer the generated SQL into their application code.

Harris is chairman of Waltham, Mass.-based Artificial Intelligence Corp., a maker of AI software.



PATRICK BLACKWELL

ARTIFICIAL INTELLIGENCE WATCH

A second AI segment that has commercial possibilities is expert systems technology. The simplest definition of expert systems is that they consist of four programming paradigms: backward-chaining inference, forward-chaining inference, object-oriented programming and hypothetical reasoning.

Backward chaining

The goal-directed, backward-chaining paradigm is the one most familiar to conventional programmers because it works much like a subroutine call mechanism. At any instant the system tries to determine the value of variable X. This is done by looking for rules that yield a value for X, that is, if $A=3$ and $B>4$ Then $X=2$.

The if condition of each rule that yields a value for X is one now evaluated to see if it is true. For example, the system would try to determine the value of A by looking for rules that yield a value of A. Once a value for A is found, if that value is 3, the system will seek to determine a value for B and so on. If one thinks of the evaluation of a variable as a subroutine call, it is easy to see how the system chains down until it finds an if test for which the values are either already known or can be asked of the user. At this point, the system begins returning these values up the calling sequence.

The forward-chaining inference approach to problem solving is as powerful as it is different from backward chaining. With forward chaining, whenever a data value changes, the set of active rules are scanned to find rules whose if conditions are now satisfied as a result of the new data value. The affected rules are added to the system's agenda. At each execution cycle, the then portion of the top rule on the agenda is executed, which, if it changes a data value, will likely cause more rules to fire and be put on the agenda.

With this facility, one can trace a variable or graph its value as it changes. The following rule graphs X: If $X=\text{any value}$ Then call graph (X).

Whenever X changes — and only then — the rule will fire, will be added to the agenda and will eventually be executed. Typically, we can define the priority of each rule to affect the order in which rules are executed on the agenda.

Intelligent data objects are at the core of expert systems' object-oriented programming paradigm, which extends the movement begun by data base technology of factoring out shareable data objects from applications. These intelligent objects know how to respond to a variety of different uses in different circumstances as well as how to relate other objects.

In their pure form, object-oriented

applications send messages to objects, and the objects know how to respond to these signals. The objects may also have rules attached to attributes that may fire each time the attribute is needed or altered.

The hypothetical reasoning paradigm refers to a class of problem-solving techniques that involve reasoning about future alternatives to determine the best sequence of steps for attaining a desired result. The classic applications of hypothetical reasoning are planning applications.

All four types of AI reasoning can be provided in the traditional DP environment. There is no inherent need for a specialized AI language such as LISP or Prolog or even for specialized hardware such as LISP machines. While today most software systems that provide these AI paradigms are LISP based, these systems are available in conventional hardware and are written in conventional languages. With interfaces to data bases, teleprocessing monitors and standard programming languages, AI will become a well-regarded weapon in the arsenal of virtually every professional systems developer.

There are three major benefits that expert system technology provides MIS. These include the new class of applications expert systems can address, the improvement of existing applications and the availability of intelligent debugging aids.

With expert systems, MIS can now address a class of strategic, mission-critical applications. The AI programming paradigms have proven to be effective in simulating intelligent decision-making capabilities. Because of this ability, MIS can for the first time address such applications as credit assessment, insurance underwriting, financial analysis, product configuration and diagnostic applications.

If these programming metaphors handle tough, new applications, they should also be helpful on certain existing applications. In fact, for traditionally hard-to-maintain components of existing systems, the AI approach may well lead to more maintainable code.

Furthermore, regression tests of rule-based programs can store not only the correct answer but also the reasoning chain that led to the answer.

Whose error?

Thus, when MIS tests future versions of programs, if these programs fail a particular test, MIS can automatically determine which change in the program made by which programmer contributed to the error. This fundamental distinction of the rule-based paradigm may ultimately lead to a major advance in software engineering.

A financial application that leverages existing information in

the corporate general ledger files ideally illustrates the productivity impact that natural language and expert systems provide. This example also shows the way in which these AI technologies must be integrated into the existing DP environment.

The basic nature of a general ledger application is to provide managers at all levels in a company with an automatic mechanism for identifying segments of the company that are not operating according to plan.

Each month the corporate general ledger produces a snapshot of the revenue and expense side of a company. This information, combined in a historical fashion, provides the basis for tracking trends and measuring the performance of various business units against plan.

Unfortunately, the complexity of such files is great. As a result, most corporations have not even been able to provide such information to managers on a query basis. Expert systems should do the work of querying the file from hundreds of different perspectives, analyzing answers, following implicit relationships between business segments and, finally, making and justifying its recommendations. This application allows management to spend most of its time focusing on those areas that require its attention.

Complexity arises

There are aspects of such applications that introduce considerable complexity, however. One is the time-series aspect that arises because data contains multiple general ledger snapshots over a variety of time frames. The other aspect arises because mainframe general ledger files always contain a mix of detail and summary records within the file. Both aspects put a considerable burden on the user who will have trouble mapping even simple business concepts onto a data base.

A concept such as "Variance" can be applied to a variety of things (variance in dollar sales vs. variance in unit sales) and can exist in multiple time periods. The concept of the "Eastern Region" requires understanding the chart of accounts and how to select in or out the proper summary level records. This is where the AI technology adds real value and where existing conventional software approaches fall short.

Conventional approaches such as fourth-generation languages, SQL or menus fail to solve this problem because they don't understand the intricate structures of such data bases and, as a result, they put too much of a burden on the user.

Although fourth-generation languages and formal query languages such as SQL are very powerful programming tools in

the hands of a trained programmer, their application as end-user tools is limited only to the technically sophisticated. Use of these systems presumes a complete knowledge of logical data base design, which most end users do not have for even simple applications much less for an application as complex as a historical general ledger. These systems simply do not supply any support to the user in terms of mapping a simple business concept onto the data base.

MIS should not mistake an end user's lack of technical programming skills for a lack of business sophistication. The real problem is bringing the computer up to the level of sophistication of the user, rather than the other way around. For example, providing a menu system to a sophisticated business professional forces users to communicate complex concepts that they routinely manipulate one grain at a time via menu interaction. This procedure brings users down to the lowest possible level.

Spreadsheets and financial modeling systems represent the most viable conventional means for dealing with the general ledger application. But once again, the logical data structure's complexity pushes even these systems beyond their limits.

Two-dimensional personal computer-based spreadsheets immediately fail to cope with what is inherently an eight-dimensional logical data structure. At a minimum, each of the following are logical dimensions: fiscal year, actual or plan, month, sales dollars, sales units, region, branch, salesman, customer, product line and product.

Spreadsheets have been very successful at manipulating two-dimensional extracts of this much larger model. But any single spreadsheet fails to capture the entire model. Multidimensional financial modeling packages can represent the logical file structure but only by substantially increasing the complexity seen by the user.

The essence of the natural language approach is to have the system understand both the intricacy of the data base structure and the meaning of user terminology. It thus becomes possible to automate the mapping of a particular request, phrased in the user's own terms, onto the data base. Looking at the aspects of data base complexity will show how this applies to the historical general ledger.

The complexity due to the inherent time series structure of the data means that every attribute in the standard general ledger occurs many times and therefore must be more fully qualified. A typical field name in this file might be "1987 ACTUAL JAN SALES."

There is an inherent structure to this time series in the us-

er's mind. Users rarely will fully qualify an attribute reference because, to them, the defaults are so obvious. It is important that the system understand the user's view of this time series, or it will be unable to understand the user's partially qualified attribute references.

A major advantage of this approach is that the system understands individual phrases such as JAN and ACTUAL. Understanding these words independent of specific fields in the data base is essential to understanding the level of user definitions that are layered on top of these words. The other aspect of the complexity of the historical general ledger problem comes from the fact that the data contains summarized and detailed facts. Once again, the natural language solution to this problem is to provide the system with a description of how the data is summarized.

No meaningless answers

Once this description is done, the natural language system can determine the proper records to retrieve to answer each user's request. If the desired subtotals are already precomputed, the answer can be retrieved directly rather than by passing much of the file to compute the subtotal. A side benefit of this approach is that the user will never be given a meaningless answer because the subtotals will never get mixed with the details.

At the end of each month, users can employ a natural language system to look for any area that is off plan. The goal of the expert system aspect of the solution is to automate this process to provide a report of business units that require management attention.

This goal seems straightforward until you realize that the data can be viewed in hundreds of ways and that the interactions can be very subtle. The problem gets particularly interesting after an anomaly is discovered, because the system must try to assess the cumulative cost of not fixing such a problem. This assessment requires knowing the interaction of the various parts of the enterprise.

These relationships, which are unique to each enterprise, can be represented within the rules of the expert system. By taking advantage of the platform provided by the natural language solution and layering on forward- and backward-chaining rules, it is possible to implement such an expert system. The system is an extremely high-level, strategic application from which any corporation can benefit.

By giving end users and DP/MIS professionals a tool that is powerful enough to address strategic business problems, AI can make a serious contribution to the productivity of DP/MIS and its entire enterprise. ♦

products

TECH TALK

Massive multiprocessor of use to mainstream DP

By MICHAEL TUCKER

This April, Cambridge, Mass.-based Thinking Machines Corp. introduced a new machine — the Connection Machine 2 (CM2). Essentially, this is an upgrade of an existing product, the CM1.

The CM2 is a monster multiprocessor — we're talking 64,000 processors. We're also talking about a price tag that starts at a cool million.

While a 64,000-processor megamachine is fascinating as a technology, it is not traditionally the sort of thing that MIS would choose for accounts payable. For that kind of task, a standard serial monoproccessor works quite nicely.

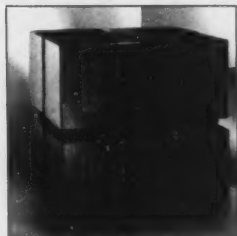
Yet two things compel me to write about Thinking Machines' product, both of which have to do with software.

One, because of its software, the CM2 may be the first massively parallel machine to demonstrate true utility to MIS.

Two, the advances that were done to make the CM1 useful to MIS — and most of those changes were in its software — say some rather important things about how so-called advanced computing will enter mainstream data processing.

Thinking Machines got its start in the early years of this decade when W. Daniel Hillis, an MIT computer scientist, wrote an acclaimed book entitled *The Connection Machine*. In it, Hillis argued for a radically new computer design — a non-von Neumann machine based on thousands of processors massively interconnected.

At about the same time, the U.S. government was becoming concerned about the U.S.'s ability to compete both commercially and militarily in an increasingly destabilized world. A number of projects were initiated to fund research and development in strategic areas. One of these areas was the Defense Advanced Research Projects Agency's (DARPA) Strategic Computing Program. DARPA was particularly interested in supercomputers.



The CM2 5-ft cube houses 64,000 parallel processors.

Enter Sheryl Handler, an entrepreneur. In 1983, she founded Thinking Machines, and Hillis, along with Marvin Minisky, became the company's founding scientists. DARPA chipped in research money, and some venture capitalists came out of the woodwork to invest. Shortly thereafter, and to the amazement of observers, Thinking Machines introduced its first machine, the CM1.

The CM1 was an impressive machine both technologically and aesthetically. Technologically, it was the first massively parallel symbolics processor. It was huge, fast and well funded. It was a supercomputer that could also fit in the artificial intelligence market just above such dedicated LISP machines as those from Symbolics, Inc. and Lisp Machine, Inc., both located in Cambridge. In fact, it used Symbolics workstations as front ends to its machine. But, unlike those workstations, the CM1 was composed of off-the-shelf hardware.

Aesthetically, the CM1 was interesting because, like the CM2, it looked the part of a supercomputer. Both machines are immense black cubes, glittering with tiny red lights. (The exact function of those little lights is unclear. The firm says they are used for certain diagnostics; cynics suggest they are just there to look pretty.)

It was blessed box, not the least because these were good times for AI and multiprocessors. Government grants, venture capital and initial public offerings were all easy to come by.

Then, in 1986, the bottom dropped out of the AI market. Makers of LISP engines found themselves in serious financial

Continued on page 63

PRODUCT CLOSE-UP

C tool cracks 640K limit

A C programming product from Natick, Mass.-based Rational Systems, Inc. may have finally put a crack in the 640K-byte programming ceiling that has plagued micro programmers and users for years.

Though IBM promised to smash the 640K-byte memory barrier with its OS/2 operating system, you may not need to wait.

Rational Systems claims its DOS/16M large memory development environment lets C and assembly language programs address up to 16M bytes of code and data under Microsoft Corp. MS-DOS Version 3.0 and up.

C compiler compatible

DOS/16M is said to be compatible with existing C compilers such as Microsoft's C 4.0 and Lattice, Inc.'s C 3.1 and 3.2 as well as with existing linkers such

as Microsoft's Link.

Terence M. Colligan, president of Rational Systems, says DOS/16M serves up two advantages for programming at the micro level. "First, it lets commercial personal computer programmers access bigger data areas for existing programs without leaving MS-DOS 3.0," Colligan claims. "Mainframe and mini programmers can now run large programs needing more than 640K bytes of memory on Personal Computer ATs and compatibles. Developers don't have to wait for OS/2 to develop large programs. They can use existing compilers and linkers and develop programs in protected mode."

Colligan also says that assembly language and C programmers

Continued on page 58

No need to wait for OS/2 to develop large programs, Rational Systems claims.

BLUE
BEAT

Reality of OS/2

Deidre Depke

The OS/2 hoopla has died down, the announcement stories have been written and analysts have burst forth with their opinions.

In case you somehow missed all the excitement, let's do a short review.

OS/2 was announced on April 2 as the operating system of choice for IBM's Personal System/2. Because the system won't be available for a while, IBM and Microsoft Corp. also served up a new MS-DOS version that will fill the gap.

OS/2 was developed jointly by IBM and Microsoft, although it's a pretty good bet that Microsoft did a lot more work on it than IBM. It is a single-user, multitasking operating system that is made up of an operating system kernel and a Microsoft Windows



presentation manager. Applications running under OS/2 can take advantage of 16M bytes of real memory or 1G byte of virtual memory.

But those are just the basics. There are a lot of additional facts that every MIS department has to keep in mind before it runs out and outfits the whole company with OS/2.

IBM and Microsoft may have a tough time delivering this product by its current deadline of sometime in the first quarter of 1988. Developers who have used early versions report that the operating system needs improvements. Besides, the software industry is notoriously bad at meeting deadlines in general, so don't hold your breath.

OS/2 isn't going to make Intel Corp. 80386-based machines

Continued on page 59

Asynchronous Unix and minicomputer technology merge in controller, page 59.

PRODUCTS

Sybase targets on-line market

Sybase, Inc., located in Berkeley, Calif., announced last May that it was entering the on-line products market. The distributed data base maker said it had modified its product, a Sybase data base management system, to operate in the commercial on-line applications world.

Specific markets that the offering will target include such I/O-intensive situations as commercial transaction processing.

This change in strategy is significant in that Sybase has traditionally existed on Unix machines and, more recently, on the Digital Equipment Corp. VAX. Both types of machines have been criticized for not having the I/O capacity necessary for heavy on-line transactions. Yet, Sybase officials claim that their product could provide the I/O muscle the hardware lacks.

In addition, the firm says it is also planning to port the product to IBM systems. Initial targets will include IBM's Personal Computer and 9370.

Originally, the Sybase data base management system's claim to fame was that it was one of the first fully functional distributed data bases.

The product, rolled out in 1985, stored data in one or more centralized host machines and ran as a front end on user workstations. In effect, it solved the distributed DBMS problem by centralizing the data and distributing the users.

Two modifications

To enter the on-line market, Sybase has modified its product in two ways. First, it has given the DBMS a multithreaded architecture. Second, the Sybase DBMS can store and use previously compiled procedures.

A multithreaded architecture can mean a number of things. Chief among these, though, is that the Sybase product

effectively gives the host machine a separate data base operating system running above the native operating system. This DBMS operating system acts similar to a real-time executive. It is faster and smaller than the native operating system but takes care of all the data search functions of the application, which frees up a portion of the native operating system for non-DBMS functions.

Moreover, the DBMS operating system can process multiple IBM SQL statements at the same time. Thus, it is capa-

ble of rapid, multithreaded operations.

The Sybase DBMS can use stored and precompiled applications written in an extended version of SQL known as Transact-SQL. Sybase says that these stored procedures can eliminate up to 80% of query processing time.

High order throughput

The company is gunning for just about any market requiring high order throughput. Sybase officers talk about using the product in everything from order-entry situations to executive information systems to automated teller machine networks.

Sybase's success or failure in this market could have long-term implications for the industry. In the past, most vendors of

DBMS for Unix and DEC machines have steered far away from on-line transaction processing.

The conventional wisdom has been that the technical requirements are just too demanding and the market is already controlled by mainframe software manufacturers, including, as of this year, IBM. Most of Sybase's rivals have been content with the existing microcomputer and minicomputer markets and with tools for developers working with IBM's DB2.

Should Sybase win its gamble, the conventional wisdom will be proved wrong.

Depending on the CPU involved, the Sybase DBMS is priced from \$1,000 to \$150,000. — MICHAEL TUCKER

Circle Reader Service Number 125

High Tech Advertising. When the

COLUMBUS, OHIO • 9:35 A.M.

After three years of development, the PC-based financial planning product of a multinational U.S. company is ready to be marketed in Western Europe and the Pacific Basin.

With a limited budget, the marketing director needs to develop an advertising plan that delivers maximum impact in targeted international markets. First, he needs to know his best prospects, then, how they view his company's products, and finally, what competition he will face.

His solution: Call International Data Group.



FRAMINGHAM, MASSACHUSETTS • 9:45 A.M.

The marketing director calls Frank Cutitta, director of IDG Communications International Marketing Services.

Cutitta decides that initial research is needed. He immediately contacts Mike Raimondi, director of Database Services for International Data Corporation's Global Data Resources.

Cutitta and Raimondi map out a comprehensive QuikSurv telephone survey which will poll both MIS professionals responsible for selecting and purchasing similar products in large corporations, and PC end-users who will actually use the product in Europe and Asia.

The marketing director authorizes the study. E-Mail assignments are quickly sent to IDC's international offices in London, Paris, Munich and Sydney.



SYDNEY, AUSTRALIA • 11:30 A.M.

Cutitta discovers strong competition in Australia where similar but lower-level PC-based financial products are already on the market. He contacts Alan Power, vice president of IDG Communications' Pacific Region and general manager of Computerworld Australia.

Power recommends a two-tier advertising campaign highlighting the product's technical breakthroughs, and stressing the program's ease-of-use and strong local sales support.



LONDON, ENGLAND • 2:00 P.M.

At the request of Cutitta, Philip de Marcellac, director of IDC's European Research Center, prepares a forecast of PC-based financial planning product sales to provide critical information as the team determines how to best reach key corporate targets.



C Tool

Continued from page 57

can directly access more than 640K bytes of memory without performing a great deal of program modification, something that is required with OS/2.

No rewriting, recompiling

"Users do not have to rewrite or recompile their programs," Colligan explains. "They can just relink them with DOS/16M's library."

Colligan claims that user programs will still be able to perform typical operations such as executing direct I/O, signaling and handling interrupts and transparently accessing video random-access memory. Such operations, according to Rational Systems, can be handled in protected mode at the same speed as real mode.

DOS/16M does not carry a light price tag, weighing in at \$29,000. Included in that cost is a royalty-free, runtime license to convert one commercial program to run in protected mode.

Rational Systems says that the license fee for additional protected-mode products for DOS/16M costs \$10,000 per product. — STAN KOLODZIEJ

Circle Reader Service Number 126

Minis get Unix mainframe link

Controller connects up to 256 asynchronous terminals

Pioneering users of Unix-based minicomputers are moving into mainframe territory, and they are bringing both Unix and mini technology with them.

"The mainframe Unix market is appealing to users who have outgrown Digital Equipment Corp.'s VAX," says Gig Graham, program director for the Gartner Group, Inc., a Stamford, Conn.-based consulting firm.

While mainframes support synchronous communications, many Unix users

prefer the asynchronous nature of Unix and the minicomputer concept in which the CPU provides full screen character support, Graham comments.

In response to these users' demands, Emeryville, Calif.-based Unisoft Corp. is bringing out a communications controller that connects asynchronous terminals to Unix mainframes.

Unisoft's 9750 CU/X combines the software house's Unix I/O terminal driver software with Santa Clara, Calif.-based

Intel Corp.'s Fastpath computer.

Reportedly, 9750 CU/X will increase speed and terminal support for Unix mainframes while reducing line costs. Traditional solutions provide support for up to 32 terminals at speeds of 1,200 bit/sec., according to Unisoft.

The 9750 CU/X allows the mainframe to support up to 256 terminals at 9.6K bit/sec., the company says. The Unisoft terminal controllers also reduce the cost of adding lines from \$3,000 to a range of \$500 to \$1,000, a spokesman claims.

Supports Amdahl UTS

The 9750 CU/X was designed to operate with all Unix mainframes, but the first release is said to support computers running

Sunnyvale, Calif.-based Amdahl Corp.'s UTS mainframe Unix.

The choice of UTS comes as no surprise for Unix industry followers. The CU/X software development has been led by Unisoft's president, Donal O'Shea, who came to the company from Amdahl where he headed UTS development. Several other Unisoft engineers came from Amdahl with UTS experience as well.

Background experience aside, Unisoft has also chosen to support perhaps the most well-established mainframe Unix operating system. UTS was the first commercially available mainframe Unix, and it also has developed the largest installed base to date. In 1986, Amdahl sold 70 new UTS licenses, according to the Gartner Group. IBM came in second with 50 new IX/370 Unix licenses in 1986.

Pricing for a 64-line 9750 CU/X unit for UTS costs \$700,000 plus a one-time \$5,000 installation charge and a monthly maintenance fee of \$700.

Each additional 64-line increment costs \$22,000 and carries a \$500 installation charge and \$200/mo. maintenance fee. — REBECCA HURST

Circle Reader Service Number 127

World is bigger than your budget.

FRAMINGHAM, MASSACHUSETTS • 4:30 P.M.

Cutitta and Raimondi meet with IDC's QuikSurv's Ken McPherson and Judy Danielson to summarize the survey findings.

Sheryl Merchant, IDG Communications International Marketing Services sales and marketing support manager, uses IDG's global E-mail Network to check foreign currency exchange rates and closing dates for all international magazines.



UNITED STATES, EUROPE, ASIA • 4:45 P.M.

Cutitta initiates a global conference call to review final recommendations with IDC's regional offices in Sydney, London, Munich, Hong Kong and Framingham. His plan is to target MIS professionals by using *Computerworld Australia*, *Computerworld Asia*, *Computerwoche*, *Computerworld Italia* and *Computer News* in England. The PC end-user campaign will stress product documentation, reliability and service, and break in *PC World* editions in England, France, Germany and Australia.



COLUMBUS, OHIO • 5:30 P.M.

The marketing director accepts the IDG recommendation and notes that the media plan prepared by IDG will penetrate all target markets within budget restrictions. He gives Cutitta a final commitment for advertising space in the selected IDG magazines. All the ads will be placed centrally through IDG/IMS in the U.S.

His new product campaign will break in three weeks.



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Blue Beat

Continued from page 57

work better, either. OS/2 capitalizes on Intel 80286 capabilities. A version utilizing native 80386 capabilities has not yet been announced.

There is no real difference between IBM's version of OS/2 and Microsoft's version of OS/2. However, IBM's OS/2 Extension does contain communications capabilities and an IBM SQL data base management system. So, if you don't want to tie your PCs into large IBM systems, buy earlier versions of OS/2.

On the other hand, if you're not a real pioneer, you will want to wait a while before buying anything. Early users report that the operating system needs both speed and performance enhancements. In fact, if you're looking for speed, put your OS/2 acquisition plans on hold. Developers say the operating system's compatibility box, which runs applications that are compatible with MS-DOS, is twice as slow as it is under MS-DOS.

If you already use personal computers with MS-DOS, the PS/2 line running with OS/2 is going to give you one big headache.

OS/2 applications will run on the PS/2, but not on PCs or compatibles. MS-DOS will run on both types of systems, but you're going to have to convert 5¼-in. MS-DOS applications to a 3½-in. format to run them on the PS/2. And conversion is neither a fun nor an easy job.

IBM and Microsoft have clearly provided the direction that will take personal computing into the next decade. But users are still left with a number of choices.

You can stick with the MS-DOS standard, which will surely evolve further this year.

Later, when questions on OS/2 are cleared up, you can make the move.

Or, if you're a real high roller, buy some PS/2s, throw an early version of OS/2 on them and accept the realities of an emerging standard.

Deplke is editor of "IBM Watch," a biweekly newsletter published by IDG Communications, Inc.

CALENDAR

July 12-18

The Fourth Annual Information Center Conference & Exposition. New Orleans, July 12-16 — Contact: Information Center Conference, Weingarten Publications, Inc., 38 Chauncy St., Boston, Mass. 02111.

Maximizing the Potential of Your Messaging System. Minneapolis, July 13-14 — Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

Managing Your System 85/75. Chicago, July 13-14 — Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

The New Standards: OSI and ISDN. San Francisco, July 13-15 — Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

Simulation and Other Tools for DP Performance Evaluation. Washington D.C., July 13-15 — Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

Data Communications: Basic Concepts. Saddlebrook, N.J., July 13-15 — Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

AAAI-87 Sixth National Conference on Artificial Intelligence. Seattle, July 13-17 — Contact: AAAI-87, 445 Burgess Drive, Menlo Park, Calif. 94025.

Intro to DMS/OS. Rancho Cordova, Calif., July 15-16 — Contact: Sterling Software, Systems Software Marketing Division, #100 11050 White Rock Road, Rancho Cordova, Calif. 95670. Also being held Sept. 23-24 and Oct. 28-29 in Ran-

cho Cordova.

Chief Information Officer: Teaming for Profit. New York, July 14-15 — Contact: William Smulsky, The Yankee Group, 200 Portland St., Boston, Mass. 02114.

Metropolitan-Area Networks. Los Angeles, July 16-17 — Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

July 19-25

Telecommunications Management. New York, July 20-22 — Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

Data Base: A Builder's Guide. Chicago, July 21-24 — Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

Advanced Postdivestiture Symposium. Denver, July 22-23 — Contact: Michele Zbiegniewicz, The Aries Group, Inc., Suite 320, 1500 Research Blvd., Rockville, Md. 20850.

Making Connections: NOMDA '87 Convention. Atlanta, July 22-25 — Contact: Dana Andrus, Public Relations, National Office Machine Dealers Association, 12411 Wornall Road, Kansas City, Mo. 64145.

Cabling and Wiring For Local Communications. Boston, July 23-24 — Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

Financial Analysis for Telecom Equipment Acquisition. San Francisco, July 23-24 — Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

ISDN: Concepts and Applications. New York, July 23-24 — Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

July 26-August 1

Computer Associates' Second Annual User Conference. Orlando, Fla., July 26-31 — Contact: Barbara Peacock, Computer Associates, Inc., 711 Stewart Ave., Garden City, N.Y. 11530.

Fiber Optic Communications. Boston, July 27-29 — Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

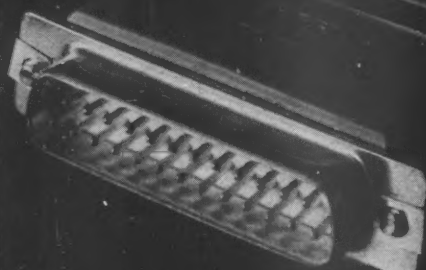
August 2-8

X.25 in Practice. San Francisco, August 3-5 — Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

August 9-15

Analytic Performance Modeling. San Francisco, August 10-12 — Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

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13 33 53 73 93	113 133 153 173 193
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FOCUS 61

PRODUCTS

Continued from page 61

FAQS/MVS job status monitor is out from Goal Systems International, Inc.

FAQS/MVS is an on-line job and status monitor for IBM and compatible mainframes.

The monitor provides IBM MVS/SP and XA users with commands for determining the status of systems or jobs within the systems. It also enables programmers to control the execution of their jobs from their terminals with no operator intervention.

FAQS/MVS costs \$7,420.

Goal Systems International, 5455 N. High St., Columbus, Ohio 43214.

Circle Reader Service Number 134

Phase Linear Systems, Inc. has announced the **Exec Productivity System (EPS)**.

EPS is a collection of integrated tools providing protection, security and function integration for programs written in IBM's Rexx or Exec 2 under the IBM VM/CMS operating system, the vendor said.

The vendor claims EPS can encode Exec programs and convert them to IBM CMS modules so source logic and other sensitive information, such as passwords and user identifications, are not accessible to other users.

EPS is priced at \$3,500.

Phase Linear Systems, 1850 K St. N.W., Washington, D.C. 20006.

Circle Reader Service Number 135

HOT SEAT

The following question was solicited from a user and conveyed to the vendor for a response

Should the IBM 9370 be used as a company's only computer, particularly for an application that, on the one hand, is I/O intensive, processed in batch mode, requires heavy print (high-speed printers) and tape and disk access and, on the other hand, is highly interactive with program development and terminal access to data?



Michael Epstein
Martin E. Segal Co.
New York

IBM: All IBM 370 processors, from the largest 3090 to the smallest 9370, have multiple processors or subsystems under the covers of each CPU or central electronic complex. The IBM System/36 and 38 processors feature a similar design.

In both product families, the multiple processors or subsystems work together as a single system and enable the system to achieve a high level of performance and service for users.

The 9370, for example, features an integrated hardware design with both an instruction

processing unit and separate I/O processors for handling I/Os. As a result, 9370 users [say they] experience consistent response time during stressful I/O workloads.

Thus, the decision as to which system a user should install — a 9370, larger 370 or System/36 or 38 — becomes a capacity, relative performance, application and environment (that is, compatibility with in a large network) decision.

The Hot Seat column consists of product- and service-related questions that you would like us to ask a particular vendor.

Is a product not working? Do you think a program is missing a crucial function? Is your vendor providing adequate service? Contact us. We'll print the questions and answers we deem of interest to our readership.

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PRODUCTS

Tech Talk

Continued from page 57

trouble. The multiprocessor firms weren't doing a whole lot better. For instance, Enmasse Computer Corp. in Acton, Mass., folded in January, three days before it was scheduled to make major product announcements at the Washington, D.C., Uniform trade show.

The reasons for these failures were partly because the slump finally caught up with the industry's front edge and partly because esoteric computing, particularly AI, had failed to deliver on the promises made by advocates.

Meanwhile, at Thinking Machines, the CM2 hit the streets.

The CM2 differs from the CM1 in only a few ways. It is a little more powerful, for instance. But, the big differences are really outside the hardware. First, the CM2 is now plugged into the Digital Equipment Corp. market, and second, the company is pushing the machine as the largest example of data parallelism.

To explain the importance of both, we've got to do a bit of historical research. Originally, in the glory days of AI and parallelism, the CM1 was an example of a standard or task-parallel system. In this approach, one takes any large problem, breaks it down into small subproblems, farms out those smaller units to individual processors and reassembles the complete answer at the end.

In theory, task parallelism could result in incredibly fast machines. In practice, writing the software for such systems can get expensive in terms of time and labor.

However, CM2 operates not under task parallelism but under data parallelism. In this approach, the computer operates as a multiprocessing but serial machine. Each of the 64,000 processors performs the same task but on different data. For example, to search a huge data base, the CM2 would divide the data base into 64,000 small sections. Then, each section would be searched by one processor. The result is one whale of a speedy search.

Tying into DEC VAXs

Indeed, it is apt to think of the CM2 as a data base engine. As it is now being marketed, the CM2 is an immense attached processor, to which DEC systems can be connected. Prior to April, Thinking Machines' supercomputers used a Symbolics workstation as a front end. The CM2, though, can attach to a DEC VAX as well as a Symbolics front end. And, you can modify existing VAX applications to exploit the CM2.

Thinking Machines will even sell you simulators that let you do CM2 program development inexpensively on the VAX. This capability gives the company a huge marketing advantage. Where before Thinking Machines was tied to Symbolics machines and the AI world, now it can exploit the much larger DEC market.

Because most DEC installations are also scientific and engineering installations, the CM2 will be used primarily in scientific and technical applications. For instance, at its introduction, CM2 beta users showed the machine doing modeling.

All this is fascinating if you're doing scientific and technical computing, but what if you are not?

The answer lies in what founding scientist Hillis said at the CM2 debut. He told the audience that his company's machine was not for everybody. "What is going on here is that we have a way of handling a particular type of problem... specifically, data-intensive problems," he said. "That's not to say that every problem in computing is that kind of problem."

He then mentioned a few places in which the CM2 would be useful. Graphics would lend itself to this type of machine because "pictures are something that in principle could be stored on a computer, but in practice aren't because of the sheer volume involved. That's the kind of thing [the CM2] can handle in a fraction of a sec-

ond because we can assign a different processor to each pixel of a display."

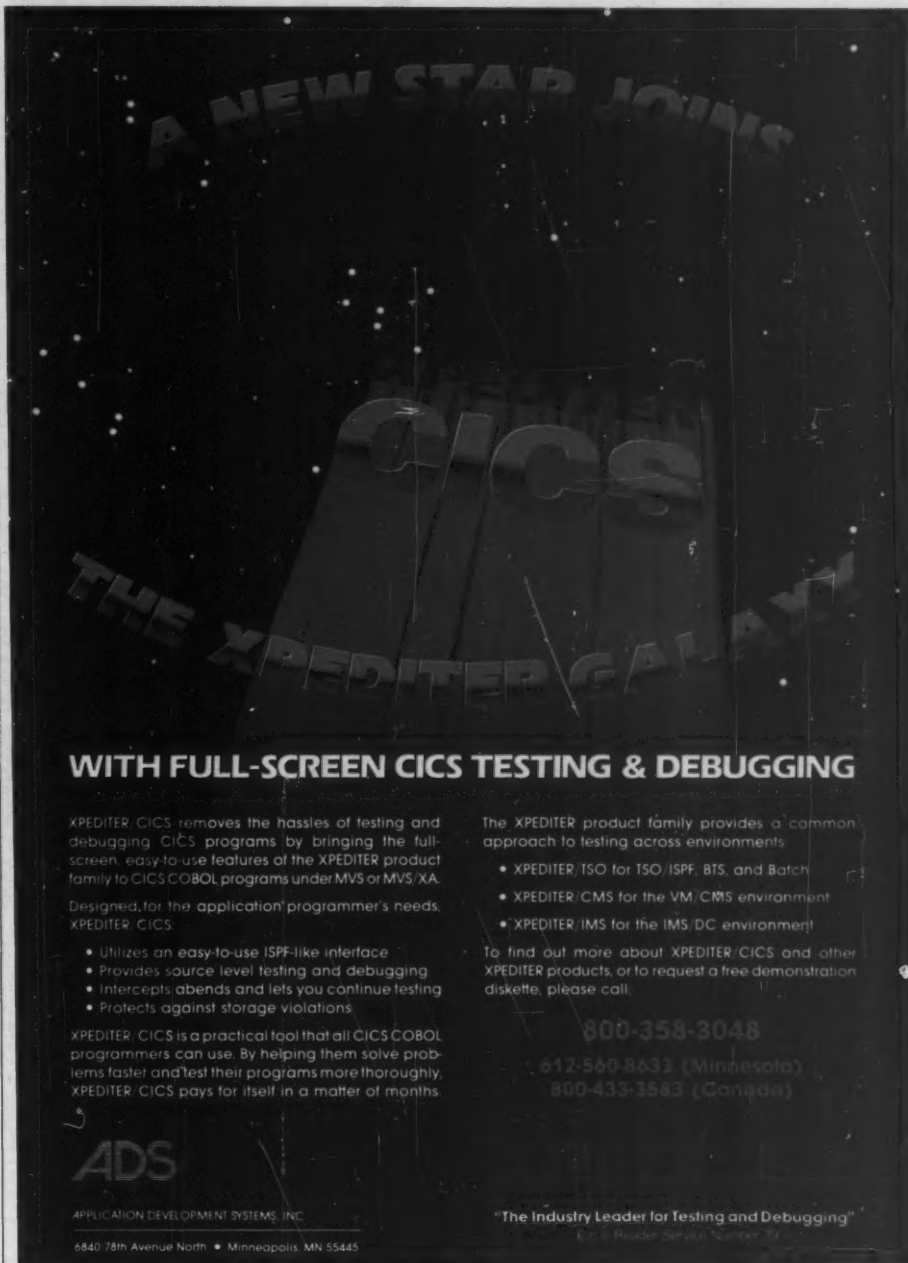
Text retrieval demo

Hillis also mentioned data bases — huge data bases. At the unveiling, Thinking Machines whipped together an application to demonstrate the way CM2 could handle full text retrieval. The vendor had the CM2 doing a word search of what amounted to an entire library. It had the machine searching a major on-line news service for every article recently published that mentioned, even in passing, a current event. The references came back instantaneously.

And that's why the CM2 is interesting to MIS. The Connection Machine may

never show up in MIS departments. But it demonstrates that multiprocessing machines have real-world, commercial DP applications — at least, in so far as they are data base engines exploiting data parallelism. This engine may be prototypical of the sort of machine that MIS will govern in the future.

If there is one theme to the recent history of MIS, it is that applications development and the management of local information are being spun off to the departmental level. But the management of central, corporate data bases has become more important and complex. Multiprocessor and data parallel devices seem tailor-made to be the machines at that centralized, corporate data center.



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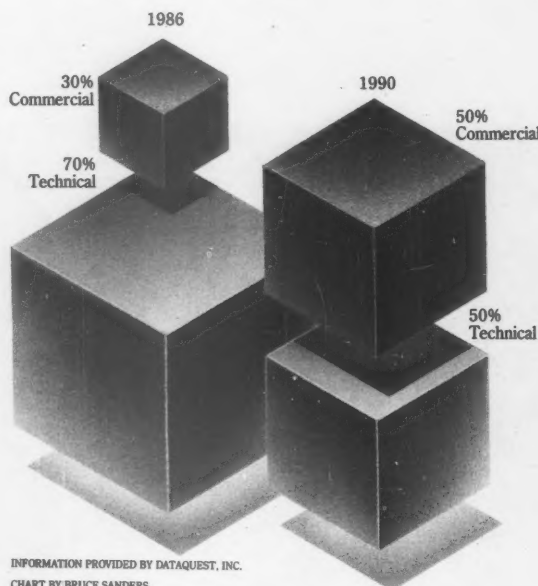
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A fifty-fifty proposition A look at Unix use in the technical and commercial arenas



next issue

Shopping for microcomputer solutions? August's *CW Focus* will feature up-to-the-minute analyses of personal computers. We'll examine the hardware and software purchasing plans of your peers and how they plan to tie it all together. In addition, discover what's in store for the de facto Intel/Microsoft standard, PS/2 and micro-to-mainframe links. Use *CW Focus* as a guide to PC trends and let us help you become a smart shopper.



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Paperless but pointless

Thomas Roberts

Office automation is built upon one central premise: The more paperless an office is, the more productive it will be.

Office automation's answer to the chaos of paper that descends daily on a worker's desk is the integrated office system, or IOS. An IOS consists of hardware, applications software and communications capabilities ideally working together in a distributed processing architecture. Its intention is to lessen the need to put information on paper. The less time an office worker spends converting data between printed and electronic media, the better.

To date, the most useful elements of every major integrated office system — including Wang Laboratories, Inc.'s Wang Office, Digital Equipment Corp.'s All-In-1, IBM's Professional Office System and others — are word processing and electronic mail.

However, in every major IOS on the market today, a host of other features surround the central word processing and E-mail functions. These peripheral features, which range from calendaring and scheduling functions to voice annotation, are the fluff of office automation.

Centralized calendaring and scheduling, for instance, sounds like a great idea. To schedule a meeting you just supply the system with the names of prospective attendees. The software then scans each user's schedule until it finds a date and time that is available to all. Each user is booked for that common date and time and receives an electronic message with the details of the meeting. Automating this process has the potential to save considerable time in tracking people down and juggling busy schedules.

To work correctly, however, an automated scheduling function demands that every employee at a site be connected to the system. Moreover, every user must dutifully see to it that all aspects of their schedules are logged on to the system. If every user is not hooked into the system and instilled with superhuman discipline, automated scheduling simply will not work.

Voice annotation in the office is a feature that appears to be little more than a ludicrous capability. The marketing pitch is usually that voice annotation of text will become a replacement for the ubiquitous yellow Post-It-type notes. But the word processing capabilities of virtually every IOS already allow notes and addenda to be attached to electronic documents.

If you are planning to buy an integrated office system or expand the one you currently have, it is important to recognize where the real productivity benefits lie. Users find word processing and E-mail features as handy today as they have been for the past decade. However, users continue to find the more peripheral functions superfluous and simply end up ignoring them.

Roberts is manager of personal computer research at International Data Corp., a Framingham, Mass.-based industry research firm.

V/UPDATE

V/SEG Ends DCSS Headaches!

Announcing V/SEG

In the early 1970s, Release 1 of VM/370 offered the twin tools of "saved system" and "DCSS" for improving system efficiency. Since both saved systems and DCSSs can be shared among many users, they allow a single copy of software to be part of, or attached to, multiple virtual machines, eliminating the need for private copies and reducing the system's sum of working sets. DMKSNT was typically changed infrequently, since CMS definitions usually varied only at VM Release boundaries and not much software was executed in shared storage.

As VM systems grew to support thousands of users instead of dozens, as more software products (from IBM and other vendors) supported execution in DCSSs, and as system administrators became more sensitive to wasting real storage on multiple software copies, DMKSNT maintenance became a more visible roadblock to system administration. Several problems emerged:

1. Selecting virtual memory addresses for software execution became harder, as the available 16 megabytes became more crowded and as inter-relationships between software packages became more complicated and less predictable;
2. Testing new versions of DCSS resident software required changes to DMKSNT, endangered production copies of software, and inconvenienced users or required off-hours work;
3. Any DMKSNT changes required a VM system generation, SHUTDOWN, and system reIPL.

We are delighted to announce the antidote to your DCSS headaches: V/SEG. V/SEG provides a mechanism by which a DCSS can be part of an "autofit" group, used to dynamically assign and load a DCSS into a virtual machine to eliminate one DCSS overlaying another. Autofit groups reduce planning and management problems associated with DCSS definitions. V/SEG extends the CP SET and QUERY commands to provide a dynamic renaming capability for saved systems and DCSSs for all or specific users without the need to IPL the system. And, it provides a "NOTIFY" option to inform users

when a requested DCSS has been processed by V/SEG, otherwise DCSS substitutions remain transparent to the user.

Finally, V/SEG can replace the on-line system name table (DMKSNT) without a SYSGEN or IPL. This allows installing new products or product versions and correcting DCSS or saved system definition errors whenever desired without disrupting system usage or requiring off-hours work. A V/SEG command provides information on alias assignments in effect, and can determine who is using a particular DCSS or saved system; a mapping utility provides a graphic representation of virtual memory allocations that simplifies selecting virtual memory addresses for software execution and identifies overlapping definitions. Call VM Systems Group for information on how V/SEG can simplify your DMKSNT management!

9370 Users Need Love (and V/UPDATE) Tool

As IBM begins shipping 9370 processors (systems, really, since most 9370s will be completely rack mounted), a new class of VM installation will emerge. The new VMers will probably not have a background in IBM mainframe computing, and

will install the 9370 (and perhaps VM/IS) as a "turnkey" system with IBM software and support. Sites and system programmers who have benefitted from local and national user groups can "pay back" what they have received by helping locate these new VM sites and making them aware of the large and vibrant VM community that awaits them. If you know of 9370 sites, encourage them to join local VM user groups, and to contact VM Systems Group for a free subscription to V/UPDATE. We will send you a free Grin and Bear It Tee Shirt for each new 9370 site/initial contact you tell us about.



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